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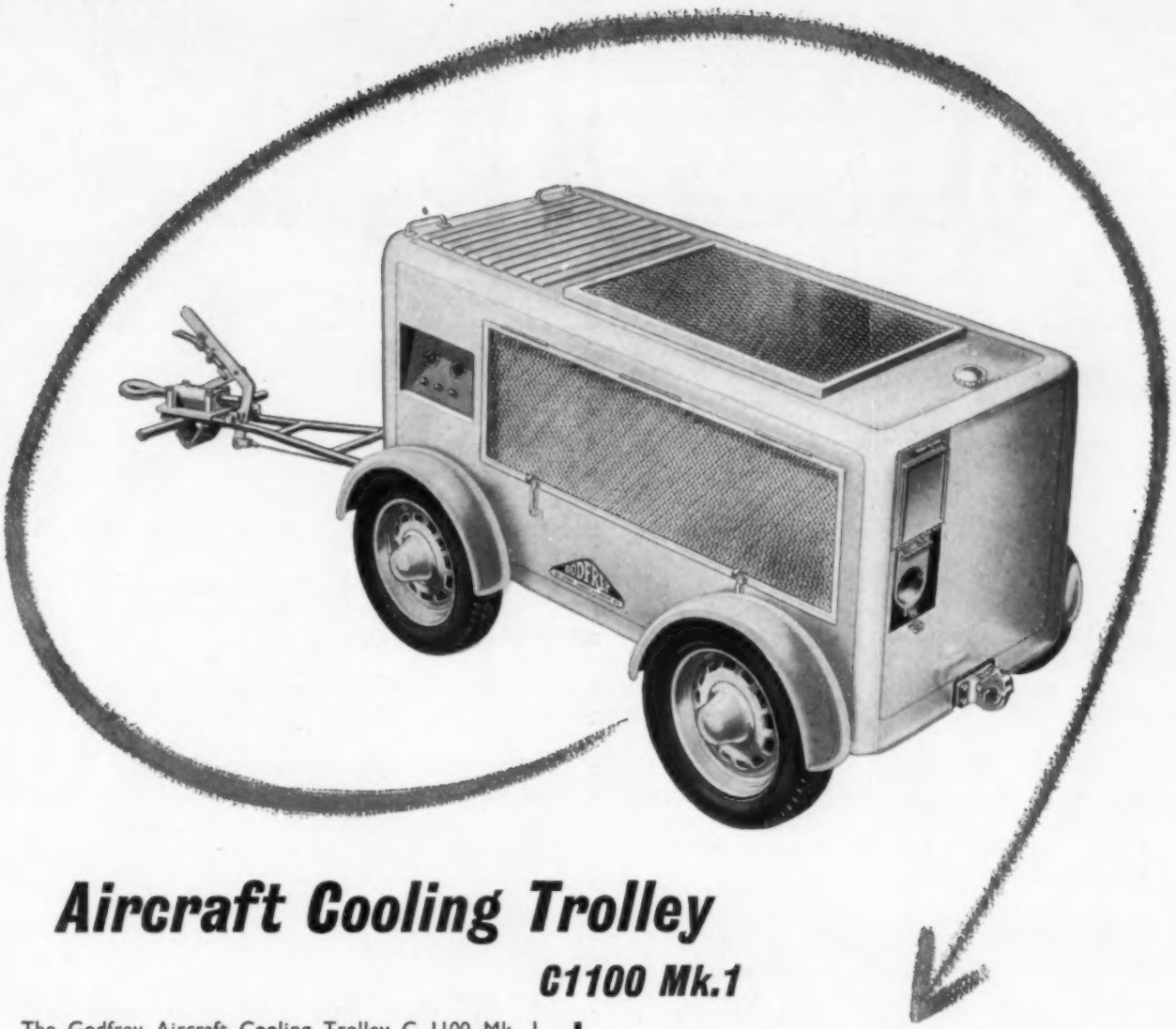

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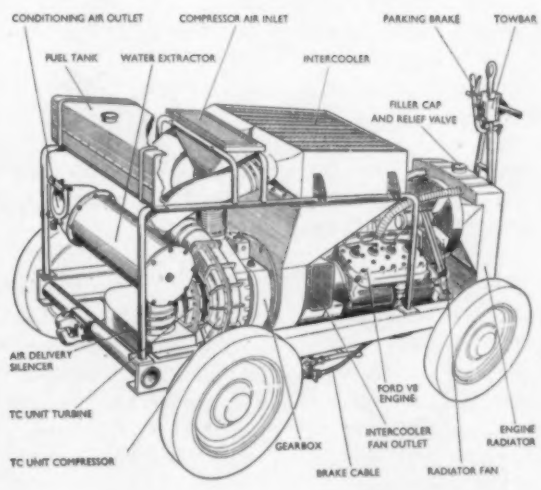

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United Airgram

UNITED AIRCRAFT EXPORT CORPORATION

UNITED AIRCRAFT CORPORATION TO HAVE TWO NEW WIND TUNNELS

Two high-speed wind tunnels will be under construction soon for United Aircraft Corporation's large research laboratory in East Hartford, Connecticut. Contracts covering construction were signed in August with the Electric Boat Division of General Dynamics Corp. The tunnels were designed for United Aircraft by the same firm.

One tunnel is a transonic unit, built to operate with wind velocities at or near the speed of sound. Testing material in this speed range requires a highly specialized technique, which has only recently become possible.

The second tunnel is to be a supersonic unit, designed to permit testing at velocities several times the speed of sound.

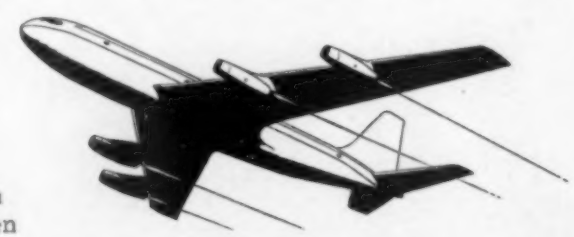
The new facilities are a major addition to extensive company-owned research capacity. This includes United Aircraft's huge subsonic wind tunnel, one of the largest in the United States; the advanced Andrew Willgoos turbine-test laboratory, a ramjet laboratory, and even new facilities for work in the nuclear propulsion field.

PRODUCTION JET TRANSPORTS ORDERED BY U. S. AIR FORCE

The U. S. Air Force has ordered a substantial number of Boeing Airplane Company's new jet-powered transports for use as flying tankers, according to a recent official announcement by the Air Force.

Prototype of the big aircraft, the Boeing 707, recently began accelerated flight testing. It is powered by four Pratt & Whitney Aircraft JT3-L turbojet engines. These engines are civilian versions of Pratt & Whitney's axial-flow J-57. They each develop 10,000-pounds of thrust to push the big transport to a speed of 550 m.p.h. and to altitudes of over 42,000 feet. Engines are mounted singly in streamlined pods below the wing.

The new tanker will be able to refuel jet bombers and fighters in the air at their own most efficient speeds and altitudes. Officials declare this will greatly increase the range, flexibility and capability of the U. S. Air Force's bomber force, which includes the global Boeing B-52s, also powered by Pratt & Whitney Aircraft jet engines, and shorter-range Boeing B-47's.



The new aircraft has not been given an Air Force designation as yet, but has been named the "Stratotanker."

HAMILTON STANDARD EQUIPS THREE NEW TURBINE-POWERED TRANSPORTS

Hamilton Standard Turbo-Hydromatic Propellers or other equipment is specified for three new American jet or turbo-prop transport aircraft, now in test flight stage. They are the turboprop-powered Lockheed R7V-2, a Navy version of the "Constellation"; the Lockheed C-130, also a turbo-prop-powered transport, and the Boeing 707, four-engined jet transport.

Hamilton Standard's light-weight pneumatic starter is used on two of the new airplanes, the C-130 and the 707. This equipment item provides an effective answer to problems of weight and power, both of vital importance in modern aircraft design.

For a weight of only 38 pounds, the air-driven starter develops over 100 horsepower.

The C-130, a medium transport which made its first flight in August, also uses anti-icing valves made by Hamilton Standard.

Hamilton Standard's new Turbo-Hydromatic propeller equips Lockheed's R7V-2. This propeller is designated the A3470. It is designed for use on turbine engines developing 6000 horsepower. More than 12 years of continuous research and development, including thousands of hours of ground and flight testing, lie behind its advanced design to assure flexibility, reliability and safety.

SIKORSKY HELICOPTER RECAPTURES SPEED RECORD

A new speed record for helicopters was set on August 26 by Sikorsky Aircraft's XH-39, a new utility helicopter designed and built for the United States Army. Flying over a three kilometer course at Windsor Locks, Connecticut, the XH-39 achieved a speed of 156 miles per hour (251 km. h.) under far from ideal weather conditions. The record is subject to final official confirmation. The old world's speed record was 146.7 m.p.h. (236 km.h.), set in September, 1953.

The little XH-39, a four-place aircraft, is powered by one Turbomeca Artouste II gas turbine engine developing about 400 horsepower for takeoff. It is connected through a conventional gear box to a single rotor head having four metal blades. Landing wheels retract.

Sikorsky engineers have been experimenting for many months with turbine power plants mounted in S-52 helicopters. Startling high rate of climb and high speed performance was achieved. Success of these experiments led to design of the H-39, whose commercial designation is S-59.

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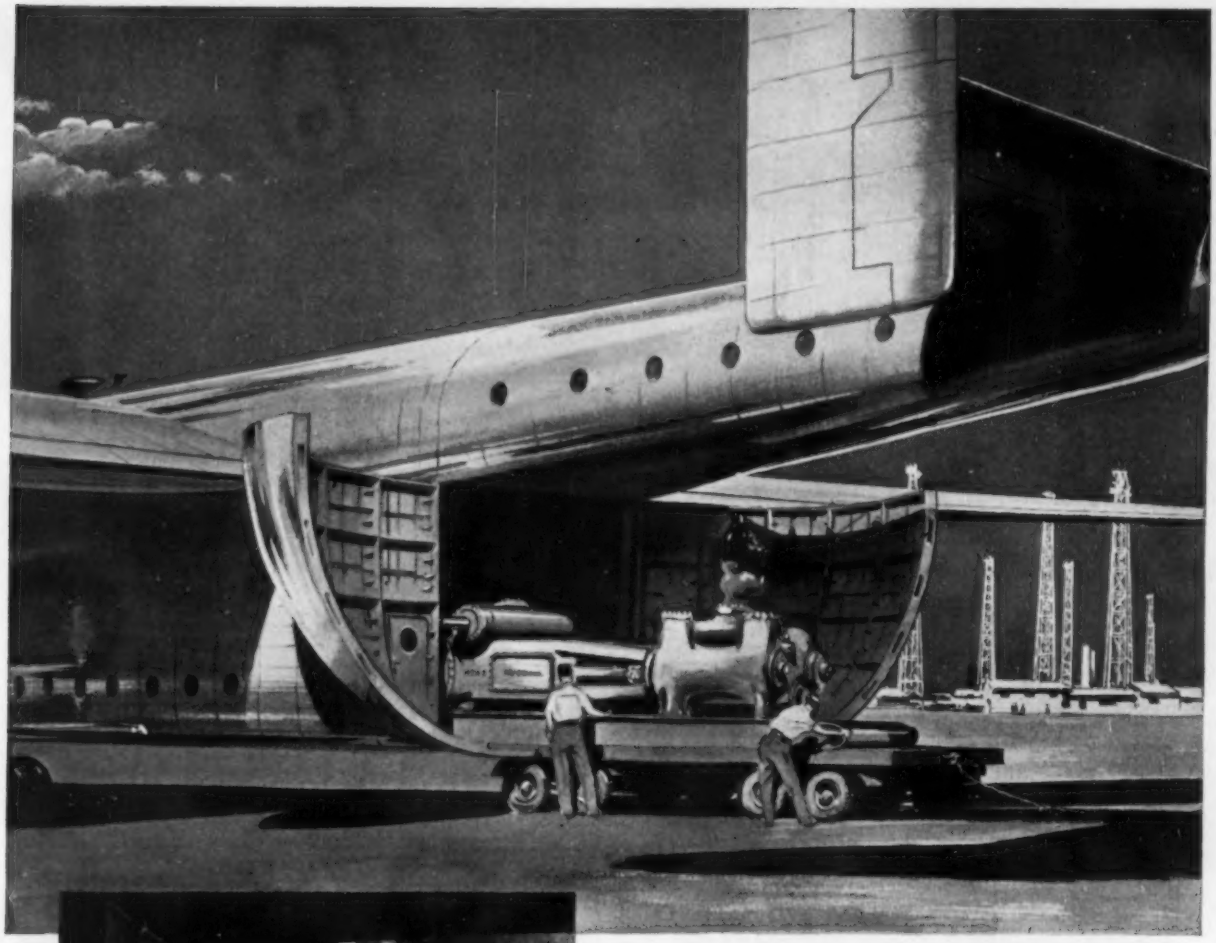

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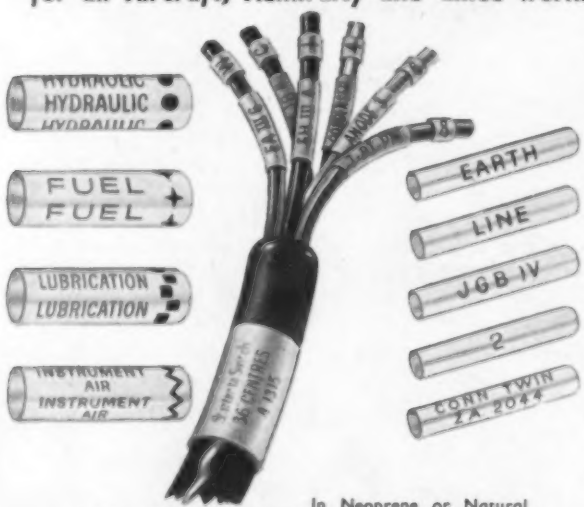

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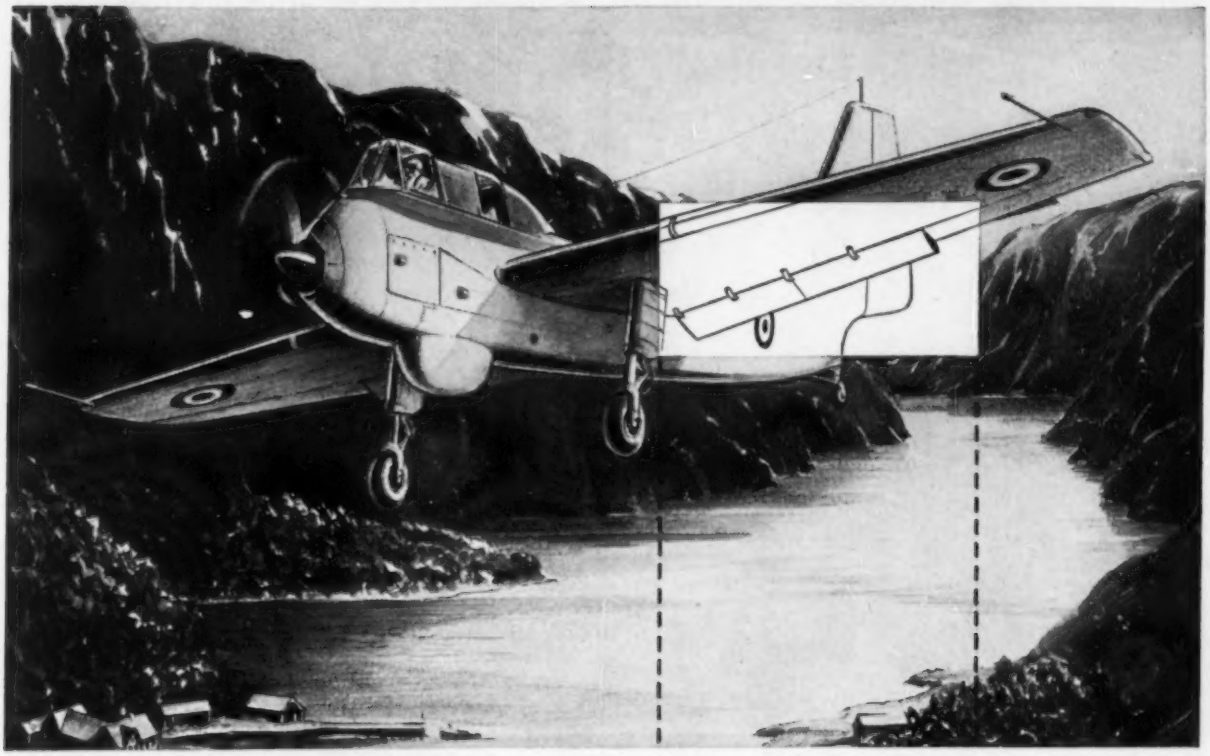

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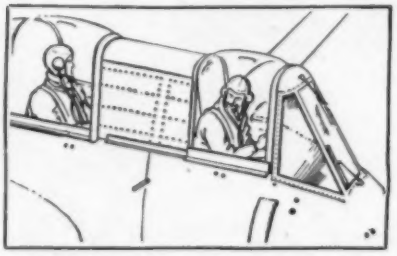

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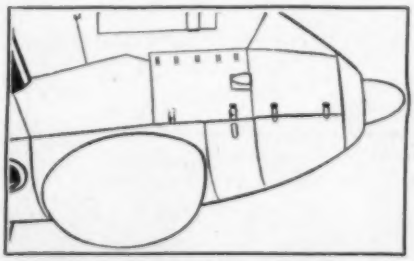

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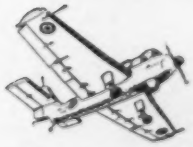

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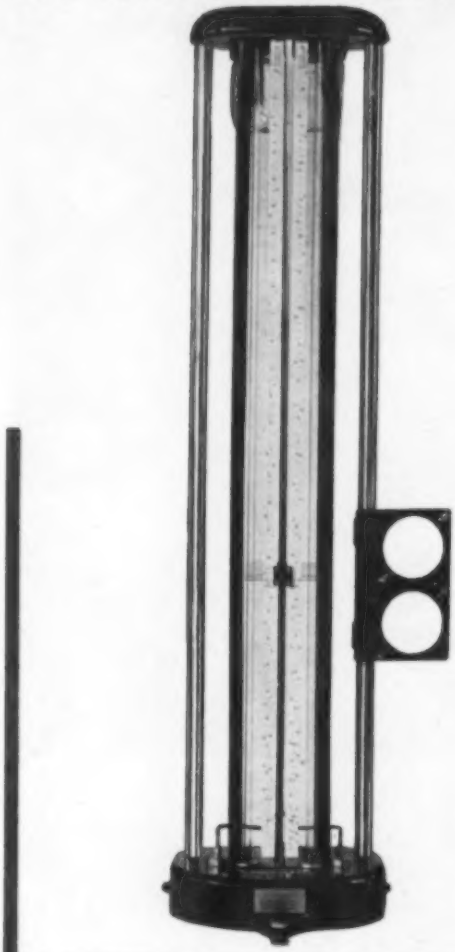

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By Any Other Name . . .

AMID the ceaseless welter of blatant fabrications and half-truths concerning Russian aircraft any new evidence bearing the stamp of authenticity must be acclaimed and studied. The most recent contribution of this sort is an article in the U.S. *Naval Aviation News*, official publication of the Chief of Naval Operations and the Bureau of Aeronautics, which, following the system introduced in the late war in respect of Japanese aircraft, allocates code-names to certain Soviet fighters and bombers. This expedient dubbing of types may have been deemed necessary either because the official designations are unknown (and those who have been concerned with air intelligence will know how this can bedevil investigation), or because they are insufficiently amenable to memorizing or pronouncing to be given currency.

Whatever the reason, we have now to mark and learn such prepossessing appellations as Bison, Badger, Bull, Butcher and Bosun—not forgetting Bob, an obsolete twin-piston-engined bomber. These names are news, and we counsel all who remain unconvinced of Russian technical achievement to take note of their attributes. Bison is a B-52 counterpart—a very large long-range bomber with turbojets so powerful that only four are required. Badger is laid out along somewhat similar lines, but is smaller and has only two jets, snuggled close into the fuselage, fighter style. It is patently a very fast and formidable aircraft and is already in service; only in America's B-66 has it a counterpart.

As for fighters, the Mig-15 is allowed to retain its proper title—a tacit tribute to a historic aircraft; but though the older La-11 and Yak-9 now rejoice respectively in the soubriquets Fang and Frank, we find no reference in the U.S. Navy's list to the new type of Soviet single-seat fighter, possibly in the Hunter/Swift class, which made an appearance—in quantity—over Moscow last May Day. It would be interesting to know the American name for this businesslike newcomer; and even more interesting to know if it would give the pilots of Hunters, Swifts and F-100s the same run for their money as did the Mig-15 when first encountered by U.S. fighters in the Korean campaign.

Independents' Choice

THE continued use of Avro Yorks for trooping flights has been criticized in the columns of a leading newspaper and also in the B.O.A.C. annual report. The newspaper spoke of "grounds for anxiety", and said that "the War Office should not allow obsolescent types of British commercial aircraft to be used for trooping operation".

This criticism seemed likely to create unnecessary concern in the minds of troops and their families. So long as the aircraft concerned has a Certificate of Airworthiness and is maintained to C. of A. standards, properly loaded and flown by qualified crews, obsolesence does not affect safety—as proved daily by DC-3 operators the world over.

A more valid objection to the granting of trooping contracts to York operators is that advanced by B.O.A.C. The Corporation points out that the Hermes, being pressurized, would offer greater comfort and more flexibility of operation than is obtainable with the unpressurized York. The disposal of surplus Hermes to independent operators has been delayed by the granting of York contracts; thus, the B.O.A.C. argument runs, if these contracts had been awarded on the basis of lower quotations by the York operators, "an economy of this kind seems . . . to be illusory, for such action can only cause a further capital loss in the Corporation's accounts, which is also tantamount to a waste of public money".

Despite the attractions of this argument, is it fair to demand that independents' re-equipment policies should be determined solely by the effect on B.O.A.C.'s balance-sheet? Undoubtedly these operators are just as anxious as B.O.A.C. to see their Yorks entirely replaced by more modern and more economic aircraft—but full-scale re-equipment will become possible only when the period of trooping contracts is extended, thus providing the security of operation necessary to attract the required capital. Summing-up, it seems to us that *independent* replacement of Yorks by Hermes is to be commended; but to demand the purchase of ex-Corporation aircraft as a condition of entry to the trooping market is to destroy half the meaning of the word independent as applied to British merchant air operations.

FROM ALL QUARTERS

The Fairey Delta 2

OFFICIALLY designated Fairey F.D.2 but known by the makers as the Fairey Delta 2, a new supersonic research aircraft, powered by a Rolls-Royce Avon, made its first flight at Boscombe Down on Wednesday, October 6th. The pilot was Mr. Peter Twiss, who is No. 2 in the Fairey "test team," under the chief test pilot, G/C R. G. Slade. They will alternate in the testing.

According to a statement by the Fairey Aviation Co., Ltd., the F.D.2, as originally conceived, "was concerned with research at speeds close to that of sound"; in the course of design and development, however, it became clear that expectations in this regard would be exceeded, and the main purpose of the aircraft is now the investigation of flight and control at transonic and supersonic speeds in level flight.

The design of the F.D.2 was supported by a particularly comprehensive programme of model trials, and it will be seen to differ vastly from its predecessor, the stubby, Derwent-powered F.D.1.

The fuselage is of almost constant section for some 30ft. The finely tapered nose (indicative of high Mach numbers) with its long probe, is arranged to tilt downwards from a point behind the cockpit in order to give the pilot better view during taxying, take-off and landing; the hinge is probably adjacent to that carrying the nose undercarriage. This curious feature is probably required owing to the combination of extreme length of nose ahead of the pilot and high angle of attack during take-off and landing. The ground angle, as shown in the photograph, seems much flatter than would be required for landing, and it is possible that the main undercarriage is arranged to "collapse" slightly after landing. This undercarriage is of advanced form. The twin-wheel nose unit, which may be steerable, folds backwards, and the main legs and their lozenge-thin wheels and high-pressure tyres are housed entirely within the very thin wing. The wing is of true delta form, and the thickness ratio is probably about four or five per cent (the lowest yet achieved in Britain). Horn-balanced ailerons are fitted, together with one large fence well inboard on each wing. There is no tailplane. The Rolls-Royce Avon is fed from lateral intakes, and appears to have reheat. Surprisingly, the engine bay has at least five auxiliary intakes, all standing proud of the outer skin.

Anglo-American

RECENT reports from the United States stress a desire among several American airframe manufacturers to use British engines. Lord Hives (Rolls-Royce chairman) is reported by *Aviation Week* to have discussed the Dart, Conway and RB.109 with various American companies, and Douglas have suggested the RB.109 for a later DC-7 and for a very advanced helicopter. The latter would be Douglas' first rotary-wing design, and it is aimed at the "DC-3 replacement" market. Rolls-Royce are also reported to have "sold the tiny Soar turbojet to U.S.A.F. for the supersonic target drone being developed by Radioplane Co., a Northrop Aircraft subsidiary." The sale was reportedly *via* Westinghouse (with whom the British company have an agreement), who "will modify the controls on the first 20 Soars to American standards."

Sikorsky are stated to be considering further development of the S-56 civil variant of the HR2S twin-engine helicopter. Suggested modifications include the fitting of wings outboard of the nacelles and the use of forward-propulsive airscrews. Licensing agreements with Westlands are reported for variants of the S-56 and S-58, with various British power units, including the Napier Eland (two for the S-56), Napier Oryx (two for the S-58) and the Blackburn Twin Artouste 600 (for developments of the S-55).

Service Pilots Fly The Midge

IN the course of an unofficial three-day visit by the Folland Midge to the Aeroplane and Armament Experimental Establishment, Boscombe Down, eight pilots of the A. and A.E.E., the Central Fighter Establishment, the Royal Aircraft Establishment and the Royal Navy took the opportunity to "have a go." Between them they logged 14 flights, of 9½ hr total duration. On the first day there were seven flights, amounting to 4½ hr, by four pilots; nearly 3 hr were put in by four pilots on the second day; and three pilots (one of whom was A. Cdre. A. H. Wheeler, O.B.E., Air Commodore Commanding, A. and A.E.E.) got in 2 hr on the third day.

During the same period, S/L. E. A. Tennant, D.F.C., Folland's chief test pilot, showed the Midge to scores of employees of the Bristol Aeroplane Co., Ltd., makers of the Orpheus turbojet, which is to power the Gnat—the fully developed Midge.

Research Foundation

THE foundation-stone of a new $500,000 (£178,570) gas-turbine research laboratory at the Avro Canada works at Malton, Ontario, was laid on October 5th by Sir Thomas Sopwith, chairman of the Hawker Siddeley Group. Present at the ceremony were a number of Hawker Siddeley and Avro Canada directors and other executives; and among the special guests were several World War I pilots—including Air Marshal W. A. Curtis, vice-chairman of Avro Canada's board—who had flown Sopwith aircraft in those early days.

The new building will consist of five major sections: the technical laboratory, with a number of specialized rigs, including a structural rig for placing complete engines under simulated flight load conditions and an overspeed pit designed to take complete rotor assemblies; materials laboratory; instrument laboratory; aerodynamics laboratory, containing a six-inch wind tunnel and an electrolytic tank for two-dimensional pressure and flow determinations; and an ignition and fuel system laboratory.

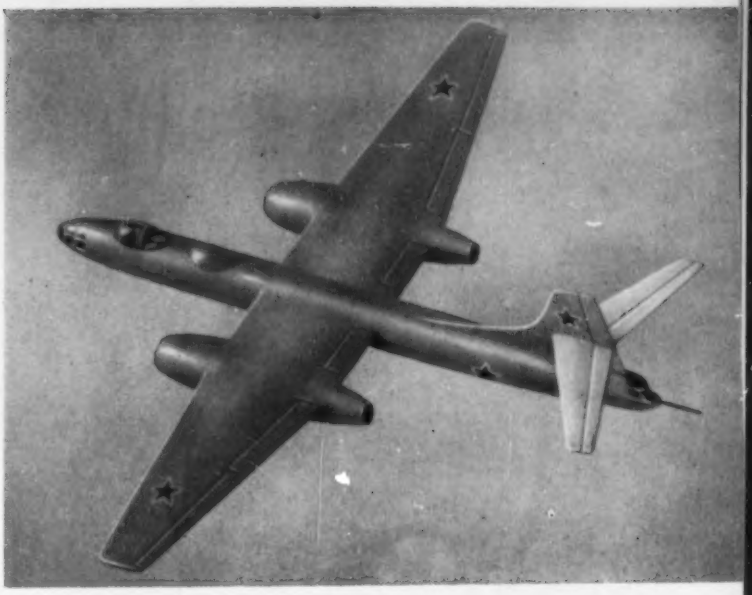
F.A.I. Conference and Awards

SEVENTY-THREE delegates represented twenty-five countries at the 47th conference of the Fédération Aéronautique Internationale which took place recently in Istanbul. Several noteworthy decisions were reached, mainly concerning private flying, and we shall record them next week.

During the course of the conference medals and diplomas were awarded. Miss Jacqueline Cochrane received the F.A.I. Gold Medal, "for her many achievements in aviation" and continuous support of private aviation. Awarded to those who, though not eligible for F.A.I. Gold Medals for flying achievements, have nevertheless given valuable service to aviation, fourteen Paul Tissandier Diplomas were granted. British recipients were Sir Sydney Camm (Hawker Siddeley), J. Smith (Vickers Supermarine), W. E. Petter (Folland), and A. G. Elliott (Rolls-Royce).

De La Vaux medals were awarded for straight-line speed records by Lt-Col. W. F. Barns, S/L. Neville Duke, Lt-Cdr. M. J. Lithgow, Cdr. J. Verdin, and Lt-Col. Frank Everest; and for closed circuit records by Miss J. Cochrane, Brig. Gen. J. S. Holtoner, S/L. Neville Duke and Robert O. Rahn. Louis Blériot medals went to W. D. Thompson for his altitude record in the Cessna XL-19B with Boeing turboprop; and to Iginio Guagnellini for his Ambrosini speed record. The Lilienthal medal was awarded to a Russian, V. Ilchenko, for a two-seat sailplane record.

AT BOSCOMBE NOW: One of the fastest aircraft in the world, the Fairey F.D.2—bearing serial number WG774—is now undergoing trials. The levered-suspension main undercarriage can be seen, as can the vee windscreen, razor-backed canopy and tail parachute stowage. (News item above).



BOSUN is the U.S. Navy code-name of this twin-jet, shore-based, strike aircraft and light bomber used by the Russian Navy. Depicted last week were the four-jet Bison and twin-jet Badger bombers, and a leading article this week has something to say about these latest Russians.

Tridac the Unique

AN abbreviation of "three-dimensional analogue computor," TRIDAC identifies an electronic calculator which has been under construction at the R.A.E. since 1950. Tridac is by far the largest "brain" in Britain and one of the largest in the world; in operation it is unique, and it is a truly immense national asset.

Designed primarily to solve three-dimensional air-defence problems, Tridac contains such ingredients as 8,000 thermionic valves, over 70 miles of wire, 2,000 adjustable potentiometers, 2,000 relays, over half-a-million terminals and 1,000 gallons of hydraulic oil. It occupies some 6,000 sq ft of floor space, consumes electricity at the rate of about 650 kW (equivalent to 850 h.p.) and has over 2,000 knobs or other controls. About 30,000 cu ft of thermostatically controlled air is passed through Tridac each minute. It cost about £750,000 and the annual running costs come to about £150,000. But it probably saves many times its capital cost each year in cutting out a huge expenditure in actual test-firing of missile prototypes, and similar work.

The original conception of Tridac was based on a system developed by the Massachusetts Institute of Technology, but any piece of apparatus of its size and scope has to be developed as it is built, and Tridac itself has no counterpart. Actual erection began at Farnborough in January 1950, the principal contractor being the computing machine division of Elliott Brothers (London), Ltd. The device is now in a state in which it can be used on actual research problems, after having first completed some months of running-in; it will never be "finished," as the R.A.E. will constantly be adding to it.

Tridac actually draws pictures of its problems—at least one of them being in three dimensions. Furthermore, actual pieces of structures, or control systems, can be inserted into the machine and their behaviour studied directly in relation to their associated functions; this can be repeated if necessary. This is made possible by the fact that Tridac works in the same time scale as the real system being examined.

A simplified variant of Tridac, named Agwac (Australian Guided-Weapons Analogue Computer), is being installed at the Salisbury, South Australia, guided-weapon research centre.

SIR RODERIC HILL

WITH deep regret we record the death, in London on October 6th, of Air Chief Marshal Sir Roderic Hill, K.C.B., M.C., A.F.C. He had been ill for several months and collapsed in the street.

The personality of Sir Roderic was that of an Elizabethan soldier-poet. He was valiant in war and in the cause of science; he wrote and drew with talent and imagination; and he was a man of great personal charm. Born at Hampstead in 1894, he was educated at Bradfield College and University College, London. Soon after the outbreak of war in 1914 he joined the Army as a private, was commissioned in France, and transferred to the R.F.C. in June 1916. He was mentioned in despatches and won the Military Cross in the autumn of that year for conspicuous skill and gallantry in the air; in August 1918 he was awarded the Air Force Cross for meritorious flying as an experimental pilot at Farnborough. During the war period, and for a time afterwards, he was a frequent contributor of drawings to the pages of *Flight*.

Nearly half his 32 years' service with the R.F.C. and R.A.F. was spent in appointments of a technical nature, among them being officer in charge of the Experimental Flying Department at Farnborough, Director of Technical Development at the Air Ministry, Director-General of Research and Development at the M.A.P., and Controller-General of Technical Services in the British Air Commission at Washington. Both as a staff officer and as a practical pilot he was interested in all sides of technical work. He was, for instance, the first man to fly a specially protected aircraft into a balloon cable—in 1918. He was among the first, in 1922, to experiment with radio telephony in the air, and during his service at Farnborough he took part in numerous early experiments relating to radio control, aero engines and structures. In 1921 he won the prize awarded annually to the officer, non-commissioned officer or airman who, in the opinion of the Air Council, had done most during the preceding year to advance aeronautical science. He experimented personally with early types of parachute and gave an astonishing exhibition of manœuvrability on a D.H.10 twin-engined bomber at the Hendon Pageant of 1922.

On leaving Farnborough Sir Roderic graduated at the R.A.F. Staff College in 1924, and was employed on Air Staff duties at Inland Area H.Q. until posted to the command of No. 45 (Bomber) Squadron in Iraq, in September of that year. His experiences of desert flying, particularly in connection with the Cairo-Baghdad mail service, were set down by him in his book *The Baghdad Air Mail*. In 1926, as a wing commander, he was transferred to H.Q. Middle East for technical staff duties, but was recalled to become an instructor at the R.A.F. Staff College. In 1931-32 he was chief instructor to (and, for a time, commanding officer of) the Oxford University Air Squadron. Subsequent appointments included those of Deputy Director of Repairs and Maintenance, Air Officer Commanding in Palestine and Transjordan, and Director of Technical Development.

Sir Roderic Hill: a photograph taken at the time when he took a personal part in operational flying against the V-1s.

During the Battle of Britain Sir Roderic was given charge of a working party to pass the 20 mm Hispano gun through its initial development phase, and he himself undertook a proportion of the flight testing in a Spitfire. On his return from Washington in 1942 he became Commandant of the R.A.F. Staff College. In that post he remained for something less than a year and in July 1943 was appointed to command a Fighter Group under Air Chief Marshal Sir Trafford Leigh-Mallory. When, in November, Sir Trafford was made Air Commander-in-Chief of the Allied Invasion Forces, Sir Roderic succeeded him as Commander-in-Chief of Fighter Command (then re-named Air Defence of Great Britain). In 1944 Sir Roderic took a personal part in flying operations against the V-1 flying bombs. In those operations he flew a Tempest, and later piloted both the Meteor and the Vampire.

In June 1945 he was appointed Air Member for Training, a post which was abolished when he became Air Member for Technical Services on January 1st, 1947. In the meantime—in May 1946—he was made principal aide-de-camp to His Late Majesty King George VI. He retired from the R.A.F. in June 1948 and was appointed Rector of the Imperial College of Science and Technology.

On the left is a recent "Flight" study of the first production Britannia Mk 100, G-ANBA. The prototype, G-ALBO, is seen (right) at Idris El Awal, where it has been engaged on trials designed to measure the effect of tropical conditions on take-off, landing and climb.

PLANNING for the BRITANNIA

B.O.A.C. Make Ready for Their New Turboprop Transports

THERE was a time, little more than three decades ago, when the first example of a new type of airliner could be delivered for passenger service within five days of its maiden flight.* Now almost as many years can pass between the first flight of a transport aircraft and the beginning of its revenue-earning life. What happens during that intervening period is a story of intensive development, research, testing, planning and productive effort—or rather a continuous series of stories concerning literally hundreds of manufacturers as well as operators, Ministries and airworthiness authorities.

Acceptance of this expensive, complex process is, paradoxically, the price to be paid for cheaper air travel. The trend is most clearly illustrated by the Bristol Britannia, which is at once the most economical transport aircraft within sight of scheduled service and the most costly airframe/engine project yet undertaken for civil use.

Since the first flight of the Britannia on August 16th, 1952, the Bristol Aeroplane Company have completed a second prototype (subsequently put out of commission by a forced landing) and the first production aircraft. The manufacturers have a number of major tasks in hand, including Proteus engine development and production, airframe production and flight-testing of the first prototype, G-ALBO, and first production aircraft, G-ANBA, with a view to obtaining a Certificate of Airworthiness. "Phase one" of this flying programme ended last week on completion of initial hot-weather trials in Tripoli.

Meanwhile, a great deal of preparatory work, as yet largely theoretical, is being performed within B.O.A.C.—mostly by the Britannia Fleet formed in August last year. Headed by Capt. W. B. Houston, as manager, the fleet consists of a nucleus of senior pilot-executives and technicians thoroughly experienced in the problems of introducing a new airliner. The flight superintendent is Capt. A. S. M. Rendall, who flew to Tripoli in G-ALBO to observe the take-off and landing trials. Responsible with him for instructing pilots and planning flight operations are Capts. F. W. Walton, T. H. Farnsworth and F. C. Hill. Senior technical officer is Mr. D. J. McAllister, and the fleet maintenance engineer is Mr. E. J. Curwood. Daily liaison between manufacturer and operator is maintained by the Corporation's resident project engineer at Filton, Mr. M. W. Anderson.

During a recent call on Capt. Houston and his colleagues at London Airport, we learned something of the progress made in planning for the Britannia. One of their foremost tasks has been the drawing-up of a "fleet development programme," which will begin when B.O.A.C. take delivery of their first Mk 100, in the comparatively near future. Every detail of the programme, other than actual dates, has been established, including the duties of all the pilots and technicians involved. Out of the flying trials will come a full set of performance measurements for application to the basic method of flight-planning evolved over the past 12 months by Capt. Farnsworth. The 11,000 hr on 40 types flown by this pilot, incidentally, includes experience of development flying on all but one of the types introduced by B.O.A.C. or its predecessor, Imperial Airways, since 1936.

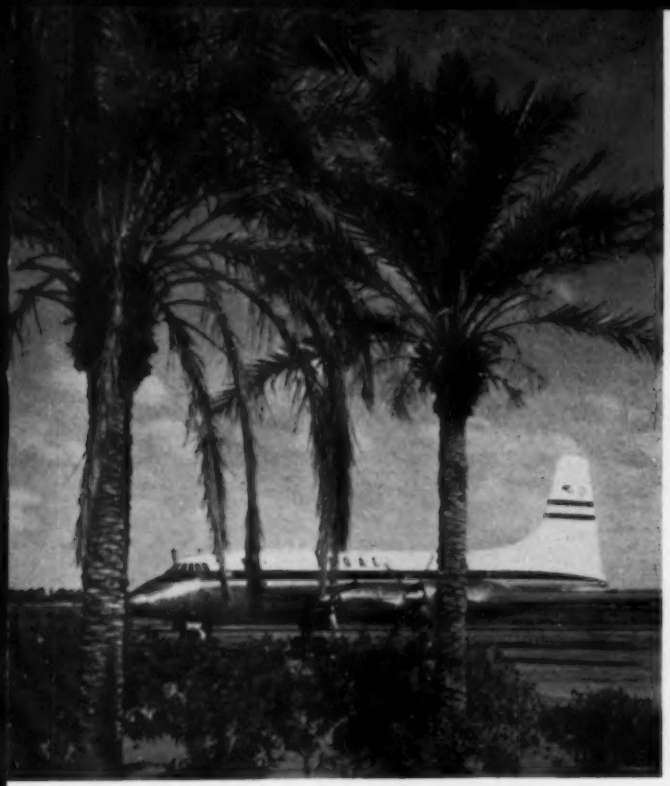
From what we have seen and heard of his preliminary work on the Britannia, it seems likely that crews will be able to complete flight plans inside ten minutes without the slightest loss of efficiency which, with a large modern transport aircraft, can result from a seemingly small variation in choice of weight, fuel load, speed or cruising height.

At the same time, the method is essentially rational in that it accepts the inevitability of small errors or tolerances in instrument-readings, and the larger errors inherent in wind forecasts. It involves a series of tables from which optimum weight, fuel requirement, pressure heights and cruising speeds can be quickly obtained for any route condition.

It is likely that the Britannia will employ a stepped-climb cruising technique, rather than the constant-incidence climb-cruise used with the Comet, whereby height was gained throughout the cruise as fuel was burnt off. The Britannia 100 will operate at lower levels (broadly speaking, within the 20,000-30,000ft band, except on the longest stages), where traffic-control considerations preclude a continuous change of altitude.

Actual performance data for the Britannia are not yet available, so it is impossible to gauge its precise effect in terms of speed, payload and range over B.O.A.C.'s network. A typical economical cruising speed suggested by Bristol's, however, is 340 m.p.h., and it may be recalled that the block speed of the prototype during its recent flight to Tripoli was 320 m.p.h.—87 m.p.h. more than the average block speed achieved last year by B.O.A.C.'s fleet. At 340 m.p.h. the Britannia 100 is credited with a still-air range of 4,100 miles with a 25,000 lb payload, or 5,720 miles with a 15,000 lb payload. On this basis, it would seem easily capable of flying a 3,000-mile stage—such as London-Lagos—non-stop, in about 9 hr, with a full load of 92 tourist passengers plus freight and reserve fuel. This particular route is at present flown in three

**The first D.H.34 made its maiden flight on March 26th, 1922, and was delivered to Daimler Airways on March 31st; its first service, to Paris, was flown two days later.*



hops by 40-seat Argonauts, which take 17½ hr elapsed time (including 15½ hr flying time) to complete the journey.

The development programme apart, the Britannia Fleet is also concerned with setting up the operating machinery in preparation for the start of scheduled services. Spares have to be stocked at base and at overseas stations, crews and maintenance staff must be selected and trained, and there are numerous forms—load-sheets, navigation logs, and the like—to be designed and printed. An elaborate programme of flight-simulator training, which includes complete long-distance trips punctuated by a wide range of in-flight emergencies, has been drawn up by Capt. Walton. The exact composition of the Britannia crew has not yet been announced, but a minimum flight crew of three could operate the aircraft on shorter routes by day.

The design of the Britannia makes provision for a large number of seating combinations, plus the ability to change interior layouts at short notice without structural alteration. Depending on B.O.A.C. requirements, Britannia 100s in Corporation service could operate in three basic versions, with seating capacity for 92 (tourist), 78 (first class) and 63 (luxury). B.E.A.'s results with the Viscount suggest that there should be little difficulty in selling the extra capacity to be made available on the B.O.A.C. Britannia routes by these appealingly fast and smooth turboprop airliners.

Just when the Britannia will enter service is not yet certain. The only date suggested by B.O.A.C. is 1955-56. It is now generally accepted that a period of intensive flying under simulated service conditions will be superimposed on the normal test programme which precedes the award of a full C. of A. Experience has shown that design faults are not always apparent during the early life of an aircraft; and it would be idle to pretend that the lessons of the Comet will not be applied to subsequent transport aircraft.

Some months may elapse, therefore, between the granting of a limited C. of A. for the Britannia and its final clearance for operating scheduled services with fare-paying passengers. In this event, production and delivery would continue at full speed, allowing B.O.A.C., if desirable, to embark on a programme of "token" scheduled services with a small fleet of Britannias. Such flights would produce experience of tremendous value not only to B.O.A.C. but to the Britannia/Proteus project as a whole, and would undoubtedly deserve a good measure of Treasury support.

Initially, Britannia 100s will probably operate on the East and West African routes, and their services will subsequently extend to other Commonwealth routes, gradually absorbing work now being done by Argonauts. It may safely be assumed that delivery of the 15 Mk 100s will have been completed in 1956, and that the flow of Britannia 300s (with increased capacity, higher performance and more powerful versions of the Proteus) will begin immediately afterwards.

Among the several B.O.A.C. captains who have experienced the Britannia as second pilots or passengers there is real enthusiasm for its handling qualities. The spaciousness of the flight deck, and the quiet, smooth conditions which prevail there, promise a marked reduction in crew fatigue by comparison with most existing types. Much thought has gone into the layout of instruments and controls, and the final arrangement is the result of long-term co-operation between Bristol and B.O.A.C. In the early stages a wooden mock-up of the flight deck was constructed, and this was subsequently inspected by selected captains at frequent intervals. A typical result of this procedure was the concentration in four separate columns of all fire-action controls for the four power-units: thus, in the event of an engine fire, the emergency drill could be performed almost automatically without a second's delay.

From a pilot's viewpoint, the Britannia is reported to give an impression of particular stability and comfort during what is the most critical phase of any flight—the approach and landing. At 120,000 lb, with full flap, the stalling speed is only 80 kt, so that the aircraft can be brought in at less than 110 kt; at the approved approach speeds, control is said to be extremely positive, with no suggestion of being "on the brink." The Britannia's "wide-screen" cockpit windows, coupled with a fairly steep approach angle, give its pilots a panoramic view of the runway ahead. Cockpit visibility is to be further improved by the addition of one roof window for each pilot.

The power unit of the 15 Britannia 100s for B.O.A.C. is the Bristol Proteus 705, which gives 3,750 e.h.p. At the present time, the Proteus has completed considerably more than 23,000 hr on the test bed and more than 3,500 in the air, in addition to thousands of hours of component running, and it should be possible to regard it as the most reliable large turboprop in the world.

The new double-helical reduction gear is fully developed, and an overspeed governor has also been designed and tested. An A.R.B. 150-hour type test was completed in the summer of this year, and it seems probable that the engine would start commercial service with an overhaul period at least three times as long (i.e. 450 hours). If scheduled service is not to take place until 1956 a still longer period should be practicable.

The 4,000 lb/sq in British Messier hydraulic system is powered by four pumps, one pair being driven by the accessory gearbox in each inboard nacelle. (In the Britannia 300, the more powerful series 755 engines do not drive accessory gearboxes. Each nacelle houses a hydraulic pump driven by an electric motor supplied with current from a system fed with current from four alternators, one on each engine. Full hydraulic power will always, therefore, be available.) The present series 100 machines can take off on three engines and, at ferrying weights, the unstick distance is never critical. Flap would not, therefore, be used. If another engine were to be lost on take-off, the machine could climb to 1,500ft, circuit and land on the remaining two engines. Furthermore, the Britannia fully meets British Civil Airworthiness Requirements on three engines, and is probably unique in this respect.

The Britannia undercarriage—another British Messier product—is also performing exceptionally well. The load-spreading afforded by the ten wheels makes the Britannia less hard on runways than are many transports with considerably lower all-up weight. Dunlop Maxaret is standard equipment, and the braking effect remarkably good. Even on an indifferent runway, the deceleration which can be produced by the wheel brakes alone can be considered more powerful than an airline would normally accept in service. The considerable reserve braking capacity is, therefore, exceptional and very welcome, and to it can also be added the effect of the four reversing airscrews, which are de Havilland units with hollow-steel blades.

Engine and airscrew control is largely automatic, and is probably the most advanced system in the world. As the Proteus is a free-turbine unit, the compressor can be maintained at the speed corresponding to maximum engine efficiency, and airscrew r.p.m. can then be chosen independently, according to the flight condition, and all engines synchronized. The Corporation will probably continue to specify kerosine as standard turbine fuel.

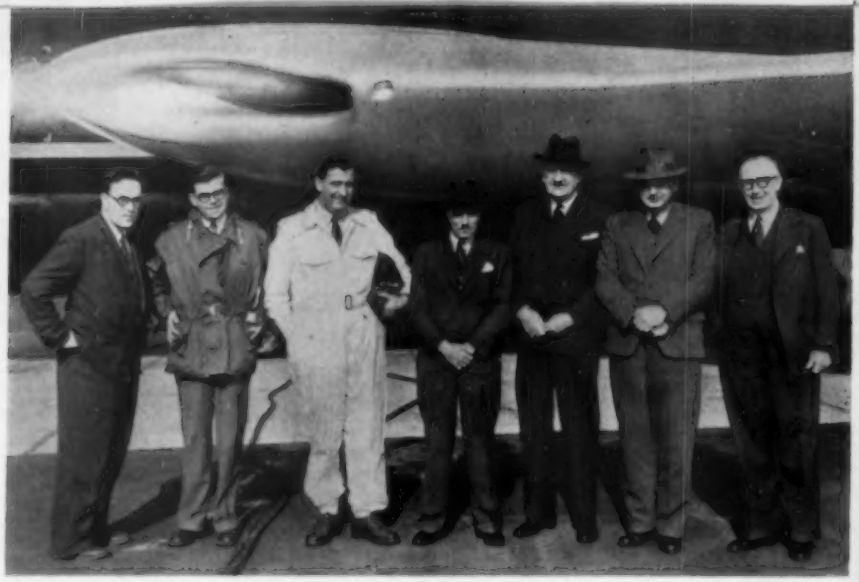
The radio and radar equipment of the Britannia is, naturally enough, representative of the very latest thought. The first three Britannias are fitted with Ekco storm-warning radar; further orders of this equipment depend upon the results of extensive trials, but the fleet staff seem confident that it will become standard. Capt. Houston considers this equipment so valuable that its introduction can be considered a step forward equal to that obtained by the use of the autopilot. Its chief advantage is that it enables schedules to be performed at any time required by the sales branch by day or night in any part of the world—something which no airline has ever yet achieved.

At present, for example, there are several regions (not all of them tropical) where night operations are technically possible but are ruled out by the discomfort likely to be experienced by the passengers; one example is the Kano region in the monsoon period. The Ekco equipment not only enables the pilot to avoid patches of violent turbulence and find the shortest way around them, but can also show him a smooth corridor between the cells of storms. The amount of fuel saved could easily be many times the weight of the radar equipment—at present about 185 lb, plus cables and presentation.

The Britannia reflects the trend of passing most of the navigational load up to the front of the aircraft; particularly on routes

(*Concluded on page* 597)

HERE AND THERE



R.A.A.F. AT RADLETT: A group photographed during the visit of the Australian Air Member for Supply and Equipment, A.V-M. J. E. Hewitt, to the Handley Page works (see "Australia and H.P.," col. 3). Left to right: Mr. K. C. Pratt, development and test engineer; Mr. R. H. Williams, flight observer, S/L. H. G. Hazelden, chief test pilot; A.V-M. Hewitt; Sir Frederick Handley Page; A. Cdre. A. M. Charlesworth; and Mr. W. H. MacRostie, H.P. chief engineer.

New Customer?

ON arrival in London last week, General Enrique Bernales, Peru's Air Minister, said that his country was "seriously considering" the purchase of British jet aircraft. This remark was underlined when, on Friday, the Minister visited the Gloster Aircraft works. He was accompanied by Col. Carlos Moya, Peruvian Air Force Chief of Staff, and Col. E. Van Oordt, a staff officer.

Vampire Trainers for Burma

THE seventeenth national air force to purchase de Havilland Vampire Trainers will be that of Burma, on behalf of which eight of these machines have been ordered. The Burma Air Force is at present equipped with piston-engined types and is experienced in operating against bandit forces. In this last connection the Vampire Trainer's heavy military load of 20 mm guns and R/P.s or bombs may be significant.

Executive Canberra

SUBJECT of the mock-up illustrated below is the projected Martin "combat transport" Canberra, basically the B-57B, with pilot and co-pilot in tandem, and dual controls. From the rear cockpit a door leads to a pressurized (to 8,000ft at 40,000ft) fuselage section in which can be fitted up to eight seats—four arranged as a divan—with coat closet, compartments for food and water, and toilet. Alternatively the cabin can accept up to 12 seats or be converted to take express freight, stretchers or aircrew-training installations. Emergency exits are provided in floor and roof, and the normal door on the starboard side is arranged to fold down, with integral steps. It will be interesting to see if a civil version appears, for there is undoubtedly a market for a super-fast diplomatic or executive aeroplane, irrespective of cost.

Encouraging Ability

ALWAYS one of the strongest advocates of the importance of good technological education, Mr. George Dowty has, through the Dowty group of companies, made available university courses to the Group's outstanding apprentices. The first group of apprentices has now commenced university training and another recipient has begun a three-year course at a college of technology. In each case the training and incidental expenses are being met by the company.

METAMORPHOSIS: This mock-up of the projected Martin "combat transport" Canberra is (see item above) touring the U.S.A. Such aircraft would carry senior officers on urgent duties.

M.T.C.A. Visitors at Yeovil

MR. JOHN PROFUMO, Parliamentary Secretary to the Ministry of Transport and Civil Aviation, accompanied by Sir George Cribbett, Deputy Secretary, visited the Westland works at Yeovil last Monday and saw S-51 and S-55 helicopters in production. The visitors left London's South Bank site in an S-51 at 10 a.m. and, travelling in the same manner, were back there in the late afternoon.

Balloonist's Death

MME. AMANDA WEBER, the 54-year-old French balloonist, lost her life on October 5th while making her 265th flight. She had ascended alone from Péronne, near Amiens, with the intention of reaching England; but apparently the wind changed during the night and her balloon was carried over the North Sea, eventually descending into the water about ten miles from Jutland. Fishermen saw the balloon fall but were too late to save its pilot.

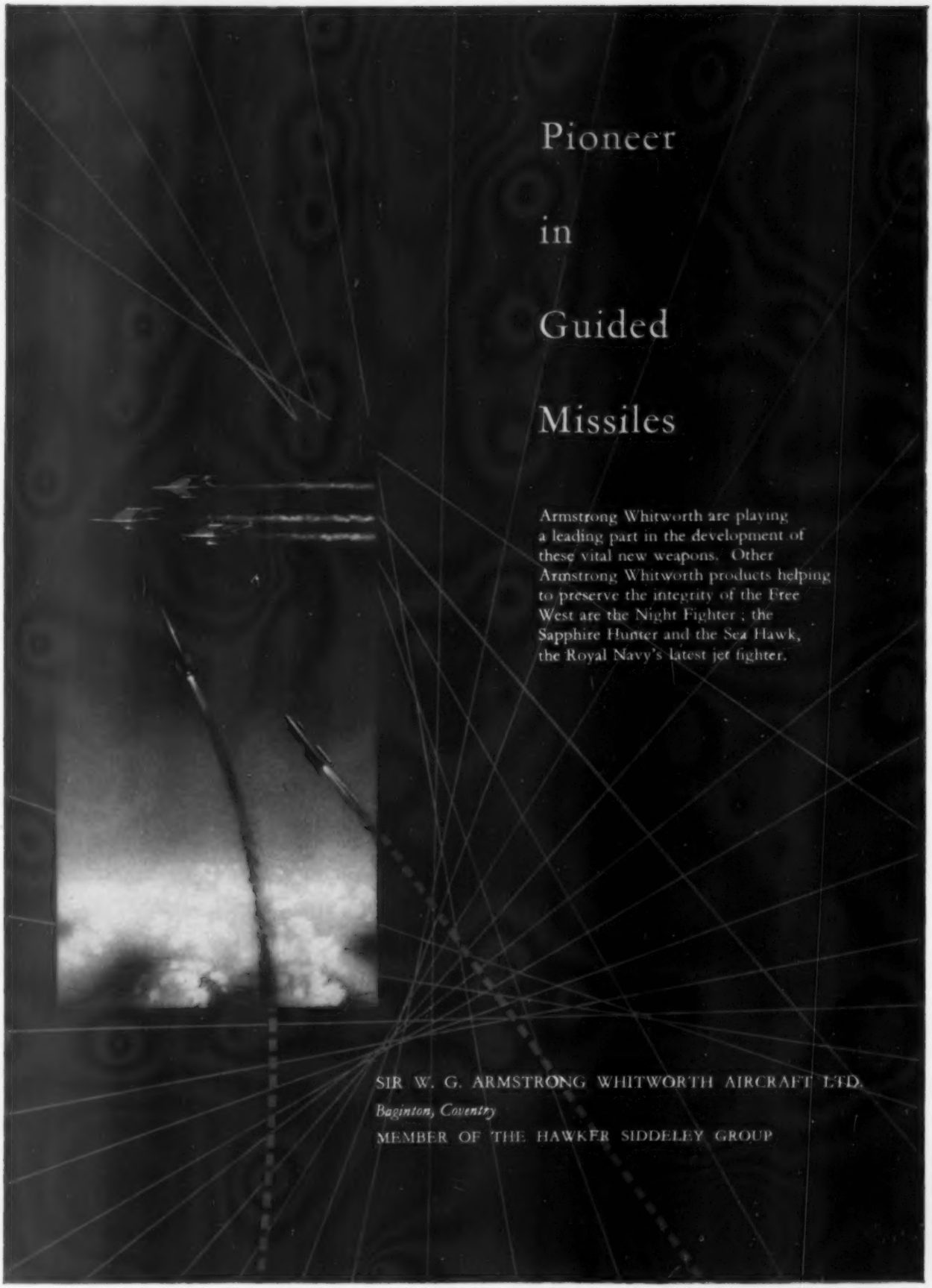
Australia and H.P.

LAST week we mentioned the visit to Australia of A. Cdre. A. V. Harvey and Mr. R. S. Stafford, of Handley Page, Ltd. Now, A.V-M. J. E. Hewitt, Australian Air Member for Supply and Equipment, who is visiting this country, has toured the Handley-Page factories. He was accompanied by A. Cdre A. M. Charlesworth, officer commanding R.A.A.F. Overseas H.Q. in London. After his tour of the works, A.V-M. Hewitt took the controls during a 45-minute flight in the second prototype Victor.

About the New Cars

IN connection with the Motor Show at Earls Court, *The Autocar* is publishing a special Show Guide Number, out today, October 15th. Next Friday, October 22nd, a greatly enlarged Show Report Number will appear, giving a stand-to-stand survey of new cars and equipment; and the following week, October 29th, a Show Review Number will provide a technical survey of design trends.

TRANS-CANADA AIR LINES
TCA
VICKERS VISCOUNT
FOUR ROLLS-ROYCE DART PROPELLER TURBINE ENGINES


Pioneer
in
Guided
Missiles
Armstrong Whitworth are playing a leading part in the development of these vital new weapons. Other Armstrong Whitworth products helping to preserve the integrity of the Free West are the Night Fighter ; the Sapphire Hunter and the Sea Hawk, the Royal Navy's latest jet fighter.
SIR W. G. ARMSTRONG WHITWORTH AIRCRAFT LTD.
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Austin-built R.E.8, showing the first modification, i.e., slight enlargement of the main fin, achieved by increasing the root chord.

THE R.E.8

HISTORIC MILITARY AIRCRAFT: No. 8

By J. M. BRUCE, M.A.

THEY called it the Harry Tate. That was, of course, inevitable. Even if the R.E.8's official designation had not lent itself so readily to that mutation, its quaint appearance was held by some to be vaguely suggestive of the music-hall mechanics so ably demonstrated by the great contemporary comedian.

The Royal Aircraft Factory's R.E. series was distinguished from the B.E., F.E. and S.E. series by two facts: no R.E. machine was produced by pseudo-"reconstruction" of some other aircraft; and the initial letters of the designation were related to no pioneer of aviation, for they never signified anything but "Reconnaissance Experimental."

In the years immediately preceding World War 1 it was widely believed that, in warfare, aircraft would be of use only as reconnaissance vehicles. From this premise it was argued that for such duties aeroplanes should be as stable as possible, so that the pilot could devote his attention to observation and leave his machine to fly itself.

With these requirements in mind, the Royal Aircraft Factory set about the design of a reconnaissance aeroplane in 1912; the machine was the first of the R.E. series, and was accordingly designated R.E.1. As has been related in the history of the B.E.2 series (*Flight*, April 2nd and 16th, 1954), E. T. Busk joined the staff of the Factory on June 10th of that year. The design of an inherently stable aeroplane was a problem which appealed strongly to Busk. In his work on the R.E.1 he collaborated with Leonard Bairstow, who had done a considerable amount of practical work at the National Physical Laboratory, based on the theoretical investigations into the stability of aeroplanes made by F. W. Lanchester and G. H. Bryan.

The two R.E.1s which were completed in 1913 differed slightly from each other, but they were of interest in having fuselages constructed of steel tubing at a time when wood was the almost universal structural medium. Both were single-bay biplanes in which wing-warping was used for lateral control, and both were powered by the 70 h.p. Renault engine.

The first R.E.1, numbered 607, was the better-looking of the two. It had a fin and plain rudder, and the mainplanes had a pronounced stagger. Later in its career it was given a set of new wings which were fitted with ailerons; stagger was reduced and a smaller fin was fitted.

The second machine, 608, had a longer fuselage. It had no fin, and was fitted with a large and very ugly balanced rudder. Busk used this machine for much of his practical work; and at one time it had four fin surfaces mounted above the upper wing. By November 1913 Busk had made the R.E.1 an automatically stable aeroplane.

One of the series went to France late in August 1914 as one of five spare aeroplanes which were sent to reinforce the squadrons in the field. It was used by No. 2 Squadron.

There are indications that one of the R.E.1s was fitted with floats, renamed H.R.E., and flown as a seaplane from Fleet and Frensham Ponds. This, however, may be a confusion with the second of the R.E. series, which was designed to the specification of the Air Department of the Admiralty for the Naval Wing of the R.F.C. The new machine was designated H.R.E.2, and was intended to be a two-seat float seaplane powered by the 100 h.p. twelve-cylinder Renault. It was first flown as a landplane, however, in which form it was fitted with a 70 h.p. eight-cylinder Renault. The H.R.E.2 was a two-bay biplane with warping wings and a fin-less tail unit similar to that of the B.E.3; both the tailplane and the elevator were one-piece surfaces, and the oval rudder was mounted above the tailplane.

When the floats and the bigger engine were fitted, the vertical tail area was increased by fitting a triangular fin and tall rudder. If the tail of the second R.E.1 was ugly, that of the H.R.E.2 was positively hideous and looked thoroughly makeshift. The H.R.E.2 was badly damaged when it failed to rise from Fleet Pond: it struck the shore, wiped off its floats, and overturned. It was rebuilt as a landplane, and ultimately had ailerons for lateral control. When war broke out the H.R.E.2 was still on the strength of the R.N.A.S.

The R.E.3 airframe was identical in appearance with that of the H.R.E.2 landplane, but the engine was the 120 h.p. Austro-Daimler.

The first R.E. type to go into quantity production was the R.E.5. Its production was made financially possible by the decision to transfer responsibility for the development of British lighter-than-air craft to the Navy. The Navy took over the Army's airships, and in exchange a sum of £25,000 was transferred to the War Office from the Admiralty vote. With this money Col. J. E. B. Seely, the Secretary of State for War, ordered twenty-four R.E.5s.

The first R.E.5 appeared early in 1914. In its standard form the type was a rather clumsy-looking two-seat tractor biplane with two-bay wings of equal span; ailerons were fitted, and the engine was the 120 h.p. Austro-Daimler. Some R.E.5s had the first of the Beardmore-built Austro-Daimlers.

By the end of March 1914 one of the R.E.5s had been specially modified for high-altitude work. It was a single-seater, and had long strut-braced extensions on the upper wings; the engine drove a two-bladed airscrew instead of the slender four-blader of the standard R.E.5, and the silencer was removed from the exhaust pipe. In this machine Capt. J. H. W. Becke climbed to 17,000ft in June 1914.

Most of the R.E.5s saw service in France from September 1914 onwards. The type was used as part of the equipment of R.F.C. Squadrons Nos. 2, 7, 12 and 16; and one was used by the R.N.A.S.

(Above) First R.E.1 in original form, with warping wings and fairly sharp stagger. (Upper right) Second R.E.1, with Edward Busk in the cockpit (note longer fuselage, balanced rudder, slight stagger and fin surfaces above wing). (Lower left) H.R.E.2 seaplane. (Lower right) H.R.E.2 landplane.

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at Dunkirk. On July 31st, 1915, Capt. John Aidan Liddell of No. 7 Sqn won the V.C. while flying an R.E.5. A shell burst directly under his machine, wounded him badly and damaged the aircraft severely; Liddell fainted, but regained consciousness in time to right the plunging R.E.5 and land it at Furnes.

One R.E.5 was fitted experimentally with air-brakes consisting of large flat plates, one on each side of the fuselage; and another, fitted with the extension-type wings of the high-altitude single-seater, had an oleo undercarriage and a rack for the R.A.F. 336-lb bomb.

The air-brakes, oleo undercarriage and large bomb-carrier all appeared on the R.E.7, which, with a wing-span of 57ft, was the biggest of the R.E. series. The fuselage and tail-unit bore a family resemblance to those of the R.E.5, but greatly increased wing area was provided to enable heavy loads to be lifted. The fuselage was of composite construction: the forward portion was made of steel tubing, but the structure aft of the cockpits was of wood.

The R.E.7 was produced in considerable numbers by several contractors—224 were delivered to R.F.C. units—but only one squadron was equipped with the type. This was No. 21, whose R.E.7s did much good bombing work during the preparations for the Battle of Somme.

The R.E.7 began life with the 120 h.p. Beardmore engine, and subsequently the 160 h.p. Beardmore and 150 h.p. R.A.F.4a were fitted. Other installations of a more experimental nature included the 190 h.p. Rolls-Royce Falcon, 250 h.p. Rolls-Royce Eagle, 200 h.p. R.A.F.3a and 225 h.p. Sunbeam.

A remarkable three-seat version of the R.E.7 also existed, but it is doubtful whether any saw action. Three-seaters with the 160 h.p. Beardmore and Rolls-Royce Eagle were tested; the third cockpit was behind the pilot and had a rotating mounting for a machine-gun.

These brief notes must suffice to describe the R.E.8's predecessors, for the eighth R.E. owed nothing to them either in construction or appearance; though it did, regrettably, retain the quality of inherent stability which, in the absence of any combat experience, had been postulated for reconnaissance aeroplanes in 1912. This is perhaps the more remarkable because the R.E.8 owed its existence to the realization, in the autumn of 1915, that the B.E.2c was obsolete. At that time R.F.C. Headquarters in France sent home a statement, based on experience gained in action, of their requirements for a corps reconnaissance and artillery-spotting aeroplane. It was particularly requested that the new machine be capable of defending itself.

Work on the design of a two-seater to meet the terms of the specification was begun at the Royal Aircraft Factory early in 1916; the designation R.E.8 was given to the new machine. In construction it differed from the earlier R.E.s by having an all-wood fuselage. At their forward ends the longerons converged to form the engine bearers. With the machine in flying position the upper longerons sloped upwards towards the tail; this gave the fuselage a peculiar appearance which was accentuated by the backward tilt which was given to the 150 h.p. R.A.F.4a engine.

The basic fuselage structure was a typical wire-braced box girder, and had a rounded top decking for part of its length. The pilot sat in the front cockpit, and a movable mounting was provided for the observer's Lewis gun which, on the prototypes, was the only weapon carried.

In appearance the R.E.8 looked more like a close relative of the B.E.2E than a descendant of any preceding R.E. type. That it did so was due to its wing arrangement: the heavily staggered mainplanes were of unequal span, and the long extensions of the upper wings were braced by wires from kingposts above the interplane struts. Ailerons were fitted to upper and lower wings, and were linked by light struts and wires; the long upper ailerons were made in two parts. The wings had wooden spars and ribs, and were internally cross-braced by wire. Both the main and auxiliary flying wires of the single bracing bay were duplicated, and the extensions of the upper wings were braced against flying loads by Rafwires running from the lower ends of the interplane struts.

The tailplane was similar in shape to that of the B.E.2E and was adjustable; its incidence could be altered by means of a hand-wheel in the pilot's cockpit. The R.E.8's resemblance to the B.E.2E was somewhat diminished by its remarkably small fin and rudder assembly: the fin was of narrow chord, and the small surface under the fuselage was little more than a fairing for the tailskid which, on the prototypes, was built into the base of the rudder.

Initial estimates of the R.E.8's performance fired the War Office with such enthusiasm that the machine was ordered virtually off the drawing-board, and the large contracts were placed with several contractors. The aeroplane was unlucky from the start. Production was delayed for some time owing to shortages of some raw materials; when the first production machines appeared they were unduly prone to spin, and many fatal accidents occurred, both at home and overseas. The unpleasantness of these crashes was increased by the readiness of the R.E.8 to burst into flames

after striking the ground. The petrol tanks were directly behind the engine, which was usually driven back into them by the impact of the crash; the fuel then poured over the hot engine and fire was inevitable.

The R.E.8 at once acquired an evil reputation which was not improved by its appearance, for the long extensions of the upper wings reminded pilots of all they had heard about the behaviour of the B.E.2E's wings. The production machines were fitted with a fixed Vickers gun for the pilot, mounted externally on the port side of the fuselage and synchronized by means of the Vickers mechanical interrupter gear. The first few R.E.8s had a rather crude form of rotating gun-mounting for the observer's Lewis gun, but the Scarff ring mounting was soon standardized.

The fin and rudder remained almost unchanged from those of the prototype; in fact, the only modification slightly reduced the size of the rudder, the lower end of which was taken up clear of the tail-skid. Investigations of the accidents showed that the area of the vertical tail surfaces was too small, and the area of the fin was thereafter progressively increased. At first the root chord of the upper fin was increased, but the small triangular under-fin remained unchanged. This proved to be insufficient, and a new under-fin of increased area was fitted. With this modification, the R.E.8's tail unit assumed that characteristic outline which was one of its peculiarities, and was more or less standardized in this form. Ultimately, however, a very much larger upper fin with a curved leading edge was fitted to some R.E.8s, and with it the aeroplane at last looked fairly safe.

The modifications were the outcome of investigations made at the behest of Lord Cowdray, then President of the Air Board, and were carried out under the direction of the deputy controller of the Technical Department. The theory of the time was that the original vertical tail was too small to counteract the torque reaction of the airscrew when the machine was climbing; consequently the swing developed unchecked until the rudder was drawn out of the slipstream and became dangerously ineffective.

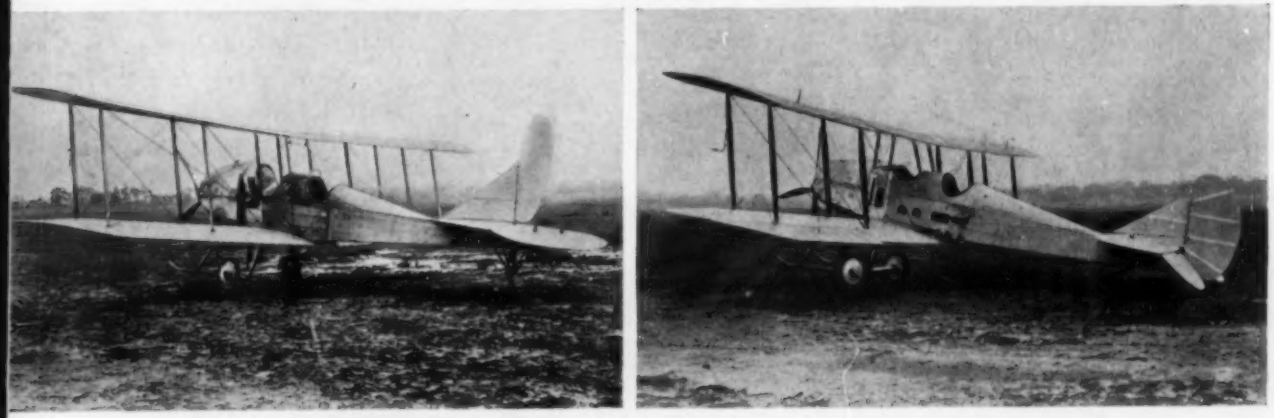
After the second modification, the R.E.8 became quite safe and manageable, and remained in service until the Armistice, when fifteen squadrons in France were still equipped with the type. Nevertheless, it was not a good aeroplane, either to fly or to fight. The R.E.8's upswept fuselage had been designed to provide a large angle of attack when the aircraft was on the ground, in the hope that the braking effect of the wings would shorten the landing run and enable the machine to use small fields with safety. Despite this, many pilots found the R.E.8 tricky to land until they were accustomed to it.

The Royal Aircraft Factory had failed to profit from the B.E.2C's frequent demonstrations that inherent stability was no asset to a fighting aircraft, for the R.E.8 incorporated some of the Factory's latest ideas on stability. Consequently it lacked the manœuvrability which was so vital in combat; and by the time it came into operational use its performance was no longer good enough.

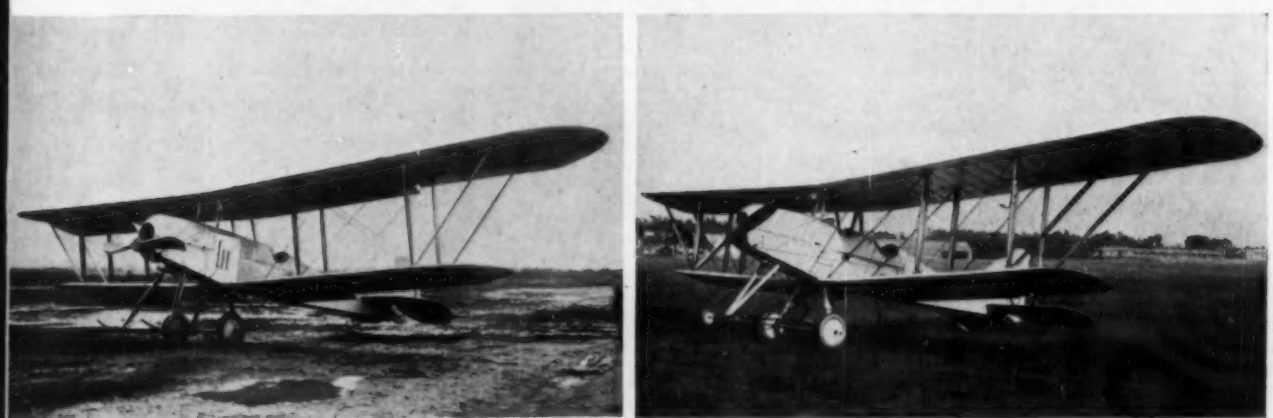
By the end of 1916, eighteen R.E.8s had been delivered to the R.F.C. in France. The first squadron to be equipped with the type was No. 21, which received R.E.8s as replacements for its B.E.12s in February 1917. On the 23rd of that month No. 59 Squadron arrived in France equipped throughout with R.E.8s; and No. 13 Squadron exchanged its B.Es for the new type in April 1917. Thereafter more and more Corps squadrons were given R.E.8s, and the last to receive the type was No. 69 (Australian) Squadron, which took its R.E.8s to France on September 9th, 1917.

April 1917 was a black month for the Royal Flying Corps. During it the R.F.C. suffered more casualties than in any other month of the war: no fewer than 316 pilots and observers were lost. In many cases the reason for losses lay in obsolete aircraft; in others, trouble with new engines and equipment was the cause; but the casualties among the R.E.8s were attributable only to the ineffectiveness of the type as a military aeroplane.

On April 13th, 1917, six R.E.8s of No. 59 Squadron set out at 8.15 a.m. to obtain photographs of the Drocourt—Quéant switch line. Only two of the machines had cameras; the other four were acting as escorts. Some reliance was placed on the presence of patrols of six F.E.2Ds, three Spads, and the Bristol Fighters of No. 48 Squadron. But the F.Es lost formation and two of their number, the Spads were late, and the Bristol Fighters saw nothing of the R.E.8s. None of No. 59 Squadron's machines returned to their aerodrome at Bellevue, and ten of their pilots and observers were killed. The R.E.8s were attacked by six enemy single-seaters led by Manfred von Richthofen, and all were shot down within



(Above) The R.E.3; note similarity to landplane conversion of H.R.E.2. (Upper right) A standard, equal-span, R.E.5. (Lower left) R.E.5 high-altitude single-seater. (Lower right) An R.E.7 with Beardmore engine (note resemblance to high-altitude R.E.5).



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minutes. Just over a year later, however, the R.E.8 was to have its revenge against Richthofen.

Despite this early proof of its inferiority the R.E.8 was issued in increasing numbers to the Corps squadrons. Like the B.E.2C, 2D and 2E before it and the D.H.9 after it, the R.E.8 had been officially selected for large-scale production; and produced it duly was, for better or for worse. After it had been in service for some time, the pilots and observers grew to understand its few capabilities and its many limitations; and thereafter the enemy fighter pilots did not have things all their own way.

This proved to be the case on August 16th, 1917, during the Battle of Langemarck. An R.E.8 of No. 7 Squadron was attacked by two Albatros scouts when taking photographs over Poelcapelle. One enemy fighter was instantly shot down by the R.E.8 observer, and the other dived away. Later that afternoon, eight Albatros scouts attacked another of No. 7 Squadron's machines. The observer fired a good burst of sixty rounds into one of the enemy machines at close range, and it went straight down to crash; all seven of the others retreated at once. An R.E.8 of No. 21 Squadron survived even greater odds that day, for it was attacked by nine Albatros scouts: the R.E.8 escaped after the observer shot down one of the enemy out of control.

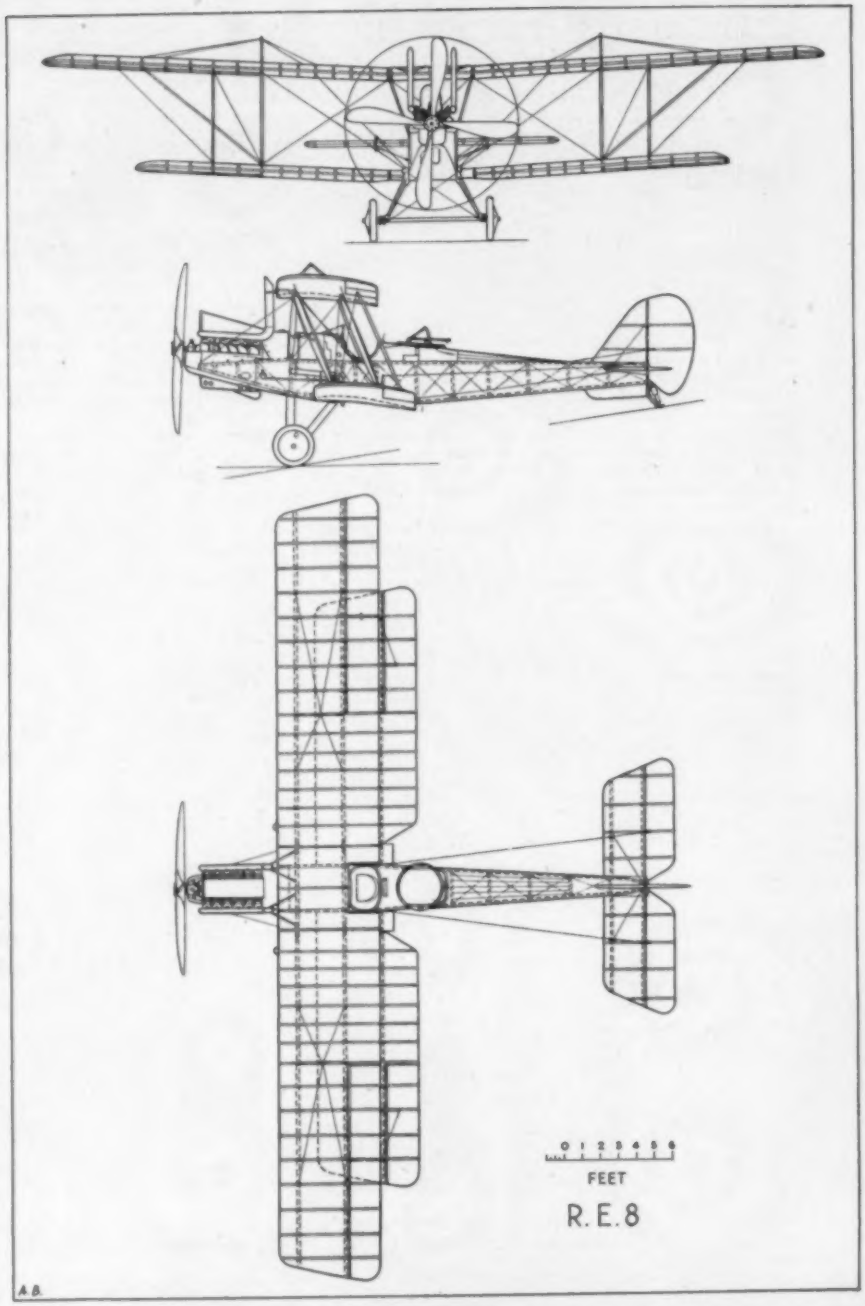
Such fights, frequent as they were (though not always so successful), were incidental to the R.E.8's principal duties of reconnaissance and artillery spotting. Those who flew in France during the years 1917 and 1918 are not likely to forget the seemingly ever-present R.E.8, flying its stolid, elliptical course, and trailing a wake of anti-aircraft shell-bursts behind it. That it did much good work in this way is to the credit of the pilots and observers who flew it. The R.E.8 was given to them without choice of alternative; and in it they did their duty.

During the Battle of Messines the R.E.8s of No. 21 Squadron enabled our artillery to master the German batteries. On June 7th, 1917, they were instrumental in bringing about the silencing of no fewer than 72 enemy batteries. Two months later, during the Battle of Ypres, No. 16 Squadron won distinction by its good work, not only in artillery spotting, but in photographic and contact patrol work.

In September 1917 the Corps squadrons of the I and III Brigades began to make night bombing attacks which were calculated to assist in the main Ypres offensive. The R.E.8s and Armstrong Whitworth F.K.8s of these squadrons made their first night raids on the night of September 5th/6th, and later in the month made machine-gun attacks against road traffic by night. These night attacks continued well into 1918, and by April of that year night reconnaissances were being made in conjunction with the bombing attacks.

During the German offensive in March 1918 the R.E.8s of the Corps squadrons carried bombs when they set out upon their normal duties of artillery co-operation, and added to the harassing of the enemy forces. The machines of No. 53 Squadron bombed and machine-gunned German troops along the front of the Fifth Army throughout the afternoon of March 21st.

On April 21st, 1918, two R.E.8s of No. 3 (Australian Flying Corps) Squadron were attacked by Richthofen's squadron. Four Fokkers detached themselves from the main enemy formation to attack, but the R.E.8s put up a stout fight. Two of the enemy fighters quickly withdrew after being hit by the observers' fire, and the British anti-aircraft gunners opened fire on the remainder of the enemy. The shell-bursts attracted the attention of Capt. A. R. Brown, who was leading two flights of Camels of No. 209 Squadron.



The rest of the action is now history. Richthofen was shot down and killed by Brown—and, as the fight drifted westwards, the Australian R.E.8s quietly returned to their job of photographing an area west of Hamel.

In July 1918 the R.E.8s of No. 9 Squadron were used to drop supplies of ammunition by parachute to infantry in forward positions. Each machine carried two boxes containing 1,200 rounds of small-arms ammunition; and each box was attached to a cylinder containing a parachute. This technique was employed frequently thereafter, and during the great Allied advance of 1918 the Corps squadrons dropped from 30,000 to 60,000 rounds per day to British troops.

The R.E.8 served in other theatres of war. In Palestine, part of the equipment of No. 67 (Australian) Squadron in 1917 consisted of R.E.8s; and in July 1917 the War Office decided to raise an R.E.8 squadron, No. 113, in Egypt for service in Palestine. The latter unit was formed at Ismailia, and the first Flight arrived at Weli Sheikh Nuran on September 23rd, 1917. The squadron was up to full strength by October 10th, but less than half of its equipment consisted of the promised R.E.8s. On October 27th,

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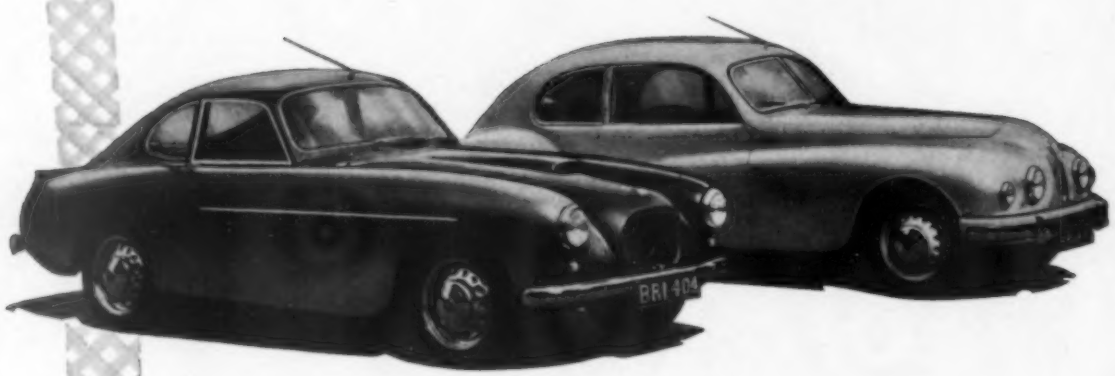

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No. 113 had five R.E.8s and eight B.E.2Es, whilst No. 67 had five R.E.8s, five B.E.12As, seven B.E.2Cs and 2Es, and one Martinsyde Elephant. A year later No. 113 Squadron had sixteen R.E.8s; by that time No. 14 Squadron had a similar number of the type, and the Jerusalem Flight of No. 142 Squadron had five.

To help the infantry during the great retreat of the Turks in September 1918, the R.E.8s of No. 113 Squadron were employed to lay smoke screens. A special apparatus had been devised for the purpose in the Middle East; by its means sixty smoke candles could be dropped successively to create a screen 400 yd long. The device was successfully used twice on September 19th, 1918, but the rout of the Turkish forces rendered its further use unnecessary.

Parenthetically it should be recorded that this was not the first use of smoke screens laid by aircraft. On August 8th, 1918, the R.E.8s of Nos. 5, 9 and 3 (Australian) squadrons laid a number of smoke screens during the Amiens offensive. This was done by dropping 40-lb phosphorus bombs, but the screens were limited and their renewal would have overtaxed any Corps squadron.

The defeat of the Turks in Palestine was effectively hastened by the R.E.8s of No. 113 Sqn on September 23rd, 1918. Sixteen aircraft dropped 122 20-lb bombs on the retreating enemy on the Es Salt to Amman road. A week later the machines of Nos. 14 and 113 Squadrons were used to carry urgently needed petrol and oil to El Affule aerodrome. The R.E.8s transported a total of 928 gallons of petrol and 156 gallons of oil.

The R.E.8 had a share in the Mesopotamian campaign. On August 13th, 1917, No. 63 Sqn arrived at Basra, and its first two R.E.8s arrived on September 14th and 16th; the remainder arrived during October. The first two R.E.8s were lost on their first reconnaissance flight over the Turkish lines. Over Tikrit they met a Halberstadt and at once dived to attack. On this occasion the extensions of the upper wing on one R.E.8 lived up to their reputation; they folded back and the machine crashed. At the same time the engine of the second R.E.8 failed, and the pilot was obliged to land.

No. 30 Sqn received its first R.E.8 on October 17th, 1917, and re-equipment continued throughout the autumn of that year. Squadrons Nos. 30 and 63 bore the brunt of the reconnaissance work of the Mesopotamian campaign, and at one time during 1918 the R.E.8s of No. 63 were averaging ten hours' flying per day.

How a Davis gun came to be in Mesopotamia in 1918 is something of a mystery. Notwithstanding the fact that it was originally developed for the R.N.A.S., a gun of that type was installed in the rear cockpit of an R.E.8 of "A" Flight, No. 30 Sqn. The weapon was mounted to fire forwards and downwards through a hole in the floor of the observer's cockpit, and the R.E.8 was then used for ground attack work.

In November 1917 No. 34 Sqn was transferred from France to Italy as part of the British detachment which was sent there to help the Italians after the calamity of Caporetto. Shortly after No. 34 Squadron's departure, No. 42 was also withdrawn from the Western Front and sent to Italy. No. 34 Squadron reached Milan on November 14th and had its R.E.8s assembled by the 17th; whilst No. 42 Squadron arrived at Istrana on December 7th and made its first operational flights two days later.

When the Italian offensive at the mouth of the Piave was launched on July 2nd, 1918, the Italians were short of aeroplanes and pilots. To help them, a few R.E.8s went daily to the aerodrome at Malcontenta, whence they flew under the orders of the Italians. The greater part of their work consisted of artillery co-operation, and for that purpose Italian observers were carried.

In August 1918 a flight of R.E.8s were dispatched to Archangel to reinforce the R.A.F. contingent in North Russia.

The Belgian Flying Corps used the R.E.8 from 1917 onwards. Twenty-two were supplied to Belgium in that year and, like the B.E.2Cs which had preceded them, were modified to have the 200 h.p. Hispano-Suiza engine. One of these machines is still preserved in the Musée Royal de l'Armée et d'Histoire Militaire in Brussels.

The R.E.8 battled on until the Armistice. It was due for replacement by Bristol Fighters powered by the Sunbeam Arab engine, but the replacements never arrived. The original date set for the substitution of Bristols was April 1918; but it was postponed until September because it was feared that a shortage of Sunbeam Arab engines would result.

Meanwhile, more detail modifications had been made. The original undercarriage, which had consisted of two vees of faired steel tubing, was replaced by a pair of wooden vee struts made of ash. The lower portion of the engine cowling was made deeper and larger, and was without the long blisters on its underside. The introduction of the very large main fin has already been mentioned. Some late production R.E.8s were fitted with Imber self-sealing fuel tanks.

For experimental purposes R.E.8s were used quite extensively, and figured in several investigations into control forces. Elevators of different areas were fitted and tested to determine what propor-

Siddeley-Deasy-built R.E.7 with 150 h.p. R.A.F. 4a engine.

An R.E.7 three-seater with Rolls-Royce Eagle engine.

R.E.8 prototype; note absence of Vickers gun. (Below) R.E.8 in first production form, with pillar-type gun mounting.

First production form of the R.E.8, with Scarff mounting.

R.E.8, second modification. A Daimler-built machine.

The R.E.8 in its near-final form—a Daimler-built machine—and, below, in its final form: this example was Napier-built.

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tion of the horizontal area provided the most efficient elevator control.

It was intended to fit the Rolls-Royce Eagle engine to 75 Napier-built R.E.8s (numbered D.4811-D.4885), but confirmation that this was done is lacking.

The Royal Aircraft Factory began experimenting with superchargers as early as 1916, and by the beginning of 1917 sufficient data had been collected to enable an exhaust-driven turbo-compressor to be designed. It was learned, however, that Professor Rateau had built a similar supercharger in France, and that it had given promising results on the test bench. Arrangements were forthwith made for a Rateau compressor to be delivered to Farnborough, where it was fitted to a 200 h.p. R.A.F.4d engine and installed in an R.E.8. The engine drove a four-bladed variable-pitch airscrew similar in general design to that which was tested on B.E.2C No. 4122. The fin and rudder of the experimental R.E.8 were enlarged, and the rudder was horn-balanced.

The first flight of this R.E.8 was made in March 1918. It was found that the engine overheated, and a much larger air scoop was fitted above the cylinders; this scoop was enormous, and was used on all subsequent flights. The variable-pitch airscrew was used only once more however, for there was too much slackness in its wholly mechanical control gear, and a specially designed two-bladed airscrew was substituted. This airscrew was used only once, and was replaced by the standard R.A.F.4d four-bladed airscrew.

The experiments terminated with the ninth flight of the supercharged R.E.8 on May 4th, 1918. Owing to a misunderstanding about the supercharger control settings, the turbine failed at 28,000 r.p.m., when the R.E.8 was at 13,700ft, and was damaged beyond repair. An installation designed wholly at the R.A.E. envisaged a supercharged R.A.F.4e engine fitted to an R.E.8, but seems not to have been built.

Two developments of the R.E.8 appeared in 1917; both were equal-span two-bay biplanes produced by modifying standard R.E.8 airframes. The machine designated R.E.8A, A.3561, was the larger of the two. The R.E.8A is said to have had a 250 h.p. Hispano-Suiza engine, but no known Hispano-Suiza had the configuration of the engine fitted to the R.E.8A as illustrated. That engine may have been fitted to the machine, but the appearance of the engine installation in the photograph and the disposition of the exhaust manifold indicate that the power-plant may have been the little-known Armstrong Whitworth Ricardo RHA, a liquid-cooled vee-twelve engine. The engine cowling was bulky, and the clumsy radiator installation must have seriously interfered with the pilot's view for landing. A new fin and rudder assembly was fitted and, as in the experimental machine mentioned above, the rudder was horn-balanced.

The R.E.9, A.4600, was generally similar to the R.E.8A, but retained the standard engine, the 150 h.p. R.A.F.4a. A horn-balanced rudder was fitted, but the fin was of greater area than that of the R.E.8A and had a straight leading-edge. The under-fin resembled that of the S.E.5. When tested at Farnborough the R.E.9 proved to have a poorer rate of climb and lower ceiling than the R.E.8.

A third derivative of the R.E.8 design was the little-known Siddeley R.T.1, which was about the same size as the R.E.8 but had two-bay wings of unequal chord and greatly increased area. The R.T.1 flew in at least three different forms, two with Hispano-Suiza engines and one with the R.A.F.4a, and its fin and balanced rudder resembled those of the R.E.8A. It should not be forgotten that Maj. F. M. Green had relinquished his post of Chief Engineer at the Royal Aircraft Factory and had joined the Siddeley-Deasy concern, who were one of the leading contractors of the R.E.8. The Siddeley R.T.1 was probably an attempt to produce a single-engined bomber based on the R.E.8, but the type was not developed. Three were delivered to the R.F.C.; and one went to France, very probably for Service trials, in 1917.

After the Armistice the R.E.8 all but vanished from the Service scene. No. 6 Squadron took its R.E.8s with it when it was sent to Basra in the middle of 1919, but elsewhere the type did not long survive. A few were retained for the completion of experiments—for instance, there are indications that an experimental installation of an R.A.F.5 engine was made in 1919—but the great majority were withdrawn and scrapped. There was nobody to regret the passing of the Harry Tate, but it will always be remembered as one of the great workers of the war days; an aeroplane undistinguished in design or performance, yet one which, in the hands of courageous men, did much good though unspectacular work in spite of itself.

R.E.8 DATA

Manufacturers.—The Royal Aircraft Factory, Farnborough, Hants.

Other Contractors.—The Austin Motor Co. (1914), Ltd., Northfield, Birmingham; Coventry Ordnance Works, Ltd., Coventry; Daimler Co., Ltd., Coventry; D. Napier and Son, Ltd., Acton; Siddeley-Deasy Motor Car Co., Ltd., Coventry; Standard Motor Co., Ltd., Cash's Lane, Coventry.

(Above) R.E.8A. (Upper right) R.E.9. (Lower left) R.E.8 with supercharged R.A.F. 4d engine and variable airscrew. (Lower right) Siddeley R.T.1.

WEIGHTS AND PERFORMANCE (R.A.F. 4a engine)

	Without bombs	2×112 lb bombs
Weight empty	—	1,803 lb
Military load	545 lb	711 lb
Fuel and oil	—	355 lb
Weight loaded	2,678 lb	2,869 lb
Max. speed:		
at 5,000ft	103 m.p.h.	—
at 6,500ft	102 m.p.h.	98 m.p.h.
at 10,000ft	96.5 m.p.h.	92.5 m.p.h.
Climb:		
to 5,000ft	11 min 25 sec	—
to 6,500ft	15 min 50 sec	21 min
to 10,000ft	29 min 05 sec	39 min 50 sec
Service ceiling	13,500ft	11,000ft
Endurance	4½ hours	—

Power Plant.—Standard: 150 h.p. R.A.F.4a. Belgian R.E.8s: 200 h.p. Hispano-Suiza. Experimental: 200 h.p. R.A.F.4d with Rateau supercharger; 150 h.p. R.A.F.5.

Dimensions.—Span: Upper 42ft 7in, lower 32ft 7½in. Length: 27ft 10½in. Height: 11ft 4½in. Chord: 5ft 6in. Stagger: 24in. Dihedral: 3 deg 30 min. Incidence: 4 deg. Span of tail: 14ft. Wing area: 377.5 sq ft.

Armament.—One fixed forward-firing Vickers machine-gun mounted on the port side of the fuselage, synchronized by Vickers interrupter gear; one Lewis machine-gun on Scarff ring-mounting on rear cockpit. Bomb load was usually two 112-lb bombs, four 65-pounders, or an equivalent weight of lighter bombs. The bomb racks were fitted under the lower wings.

Costs.—R.E.8 airframe, less engine, instruments and guns, £1,232; 150 h.p. R.A.F.4a engine, £836; 200 h.p. Hispano-Suiza engine, £1,004.

Service Use.—*Western Front:* R.F.C. squadrons Nos. 4, 4(A), 5, 6, 7, 9, 12, 13, 15, 16, 21, 34, 42, 52, 53, 59, 69 (Australian) (later No. 3 Sqn, A.F.C.), H.Q. Communication Squadron. No. 56 Squadron had one R.E.8. Type was also used by Belgian Flying Corps. *Italy:* R.F.C. Squadrons Nos. 34 and 42. *Palestine:* R.F.C. Squadrons Nos. 14, 67 (Australian), 113 and 142 (one Flight). *Mesopotamia:* R.F.C. Squadrons Nos. 30 and 63. *Russia:* R.A.F. Contingent at Archangel. *Home Defence:* No. 77 Sqn. *Training:* Used at W/T. Telegraphist School, Chattis Hill; School of Army Co-operation, Winchester; School of Photography, Maps and Reconnaissance, Farnborough; Air Observers' Schools at Eastchurch, Manston and New Romney; Advanced Air Firing School, Lympne; No. 20 Training Squadron, Wye; No. 31 Training Squadron, Wyton; No. 39 Training Squadron, Narborough; Artillery Observation School, Almaza, Egypt.

Production and Allocation.—A total of 4,077 R.E.8s were built; of these 45 were constructed at the Royal Aircraft Factory. The squadrons with the Expeditionary Force received 2,157; the total number of R.E.8s sent to the Middle East was 327; 105 went to Italy; 19 to Home Defence units; and 1,195 to training units. Twenty-two were delivered to Belgium.

The R.A.F. had 1,913 R.E.8s on charge on October 31st, 1918: 674 in France, 49 in Italy, 56 *en route* to the Middle East, 127 in Egypt and Palestine and 53 in Mesopotamia. At home, two were with Home Defence units, 167 at schools, 59 at Aeroplane Repair Depots, 111 at Aircraft Acceptance Parks and with contractors, 282 in store, 58 in Ireland, and 275 at various home stations.

Known Serial Numbers and Manufacturers.—7996-7997: prototypes built by Royal Aircraft Factory. A.66-A.115. A.3169-A.3268: built by Austin. A.3405-A.3504: built by Siddeley-Deasy. A.3506-A.3530: built by Royal Aircraft Factory. A.3531-A.3680: built by Daimler. A.3681-A.3830: built by Siddeley-Deasy. A.3832-A.3931: built by Napier. A.4161-A.4260: built by Daimler. A.4261-A.4410: built by Austin. A.4411-A.4560: built by Standard. A.4564-A.4663: built by Standard. A.4664-A.4763: built by Coventry Ordnance Works. A.6801-A.7000: allotted for R.E.8s to be built by the British and Colonial Aeroplane Co., Ltd., but contract cancelled and serial numbers re-allocated.

B.836, B.845: probably rebuilds by the Southern Aeroplane Repair Depot. B.3401-B.3450: built by Daimler. B.5001-B.5150: built by Daimler. B.5851-B.5900: built by Austin. B.6451-B.6480: built by Siddeley-Deasy. B.6481-B.6624: built by Siddeley-Deasy. B.6631-B.6730: built by Coventry Ordnance Works. B.7681-B.7730: built by Siddeley-Deasy. C.2231-C.3080: built by Daimler. C.4551-C.4600: built by Napier. C.5026-C.5125: built by Coventry Ordnance Works.

D.1501-D.1600: built by Standard. D.3836-D.3910: built by Napier. D.4661-D.4810: built by Standard. D.4811-D.4950: built by Napier (D.4811-D.4885 were intended to have the Rolls-Royce Eagle engine). Probably D.4950-D.5000 were R.E.8s; only D.4960 is known. D.6701-D.6850: built by Coventry Ordnance Works. E.1-E.300: built by Siddeley-Deasy. E.1101-E.1250. Aircraft within and about the range F.3308-F.3340 were R.E.8s built by Siddeley-Deasy. Another later batch lay about F.3555-F.3557, and may have been F.3498-F.3747. F.6016 was an R.E.8, as also was H.7042.

Notes on Individual Machines.—A.3475: No. 39 Training Squadron, Narborough; had the final large fin. A.3561: became R.E.8a. A.3652: Presentation aircraft, "Australia No. 19, Sargood Bros." A.3662: Presentation aircraft, given by Mr. H. Teesdale Smith; "J" of No. 3 Sqn, Australian Flying Corps. A.3747: Presentation aircraft, "Australia No. 20, N.S.W. No. 18, 'The McCaughey.'" A.3754: Presentation aircraft, "Australia No. 21, N.S.W. No. 19, 'The Narrandera Jerilderie.'" A.3792: Presented by the Hon. A. N. Kenion, "Malaya No. 32, 'The A. N. Kenion.'" A.3902: fitted with final large fin. A.4537: used by No. 3 Training Squadron, Wyton. A.4600: became R.E.9. B.836: aircraft "15" of No. 15 Sqn. B.3412: No. 15 Sqn. B.5106: "IA," No. 59 Sqn. C.2298: Presentation aircraft, "The North Queensland Residents." C.2441: fitted with final large fin. C.2670: Presentation aircraft, "Punjab No. 25." D.4960: used in Russia, 1919. E.26: fitted with final large fin.

British Interplanetary Society's 21st Anniversary

THE British Interplanetary Society's first publication, dated January 1934, recorded a total membership of just over a dozen. This week, 21 years after the Society's formation on October 13th, 1933, the membership stands at 2,630. Those years before the war were hard ones for P. E. Cleator, the founder of the Society, and his assistants, for very few people took the idea of space-flight seriously. There was great interest in astronautics in the early 'thirties, following the practical work of the German *Verein fur Raumschiffart*, but it dwindled during the later years of that decade, largely owing, no doubt, to the almost complete lack of published progress. By August 1939 the membership was still far short of the 200 that it had been hoped to reach.

At the beginning of the war it was decided to put the Society, with a "ghost" council, into cold storage for the duration. Yet in this country the astronautical movement did not come to a complete halt. Before the war there had been a number of small local societies, mostly of the schoolboy-enthusiast type. Two of these small organizations, the Astronautical Development Society and the Manchester Astronautical Association, continued their existence, joining forces early in 1942 to become the Combined British Astronautical Societies (C.B.A.S.), which body remained active throughout the war. Then, at the beginning of 1946, the B.I.S. was resuscitated by the "ghost" council and the C.B.A.S., and by September 30th, 1946, its membership totalled 269. Since then a steady rise has been recorded, and it is hoped that the 3,000 mark will be topped by September 1955.

In the years before the war the Society and its views were sometimes regarded with derision, if not with suspicion. This attitude has now largely disappeared. Few technical people query the possibility of space-flight, and most arguments against are now of the "is-it-worth-it?" variety. The general public hears so much about space-flight that many who would have laughed the idea to scorn before the war now accept it readily.

It is interesting to compare the astronaut of today with the aeronaut of 1887, the 21st year of the Royal Aeronautical Society (or "Aëronautical Society" as it then was). At that time the Society was in the doldrums. Only one meeting a year was held; an annual report was published, but there was no journal. For 1887 no report was issued, and the next report, dated 1890, covered the period 1888-1890. The major papers dealt with kites, balloons and the design of working model birds. The frontispiece was a photograph of a vehicle of about 30ft span, modelled after a crow; according to the accompanying text it would certainly fly when powered by a light and powerful enough engine—which, unfortunately, did not exist. All of the research of that time was carried out by private individuals; and although some of them—for example, Maxim—had considerable resources, their progress was comparatively slow.

In contrast, the modern astronaut is having much of his work done for him at public expense. The missile programmes of the major powers cover propulsion, control, light-weight structures and many other fields essential to space-flight. Although most of this work is classified, there can be little doubt that it will in time be available for use in a space-flight programme.

That astronautics is now a respectable pastime for many engineers and scientists is no doubt largely due to the remarkable wartime German advances in rocketry and to the British and American advances in nuclear power during the past decade. The German work, in particular the development of the V.2, showed that large liquid-propellant rockets could be satisfactorily built and fired; whilst nuclear development, although it has not yet produced a suitable power plant for a space-ship, has at least shown that nuclear energy can be released at a controllable rate, and that potential ways exist of applying it to a rocket type of drive.

Since the war astronautical societies have sprung up in many parts of the world, and relations between them have been most cordial. In 1949 the Germany society, the *Gesellschaft fur Weltraumforschung*, proposed an international federation of societies, and in August 1950 the first International Congress on Astronautics was held in Paris. The International Astronautical Federation (I.A.F.) now has a total membership of 18 societies, representing 7,590 individual members in 17 countries, and has held five annual congresses. Its latest activity is the publication of an international journal, *Acta Astronautica*.

To return to our own interplanetary society;* its present activities are confined to the publication of a bi-monthly journal and the holding of regular meetings both in London and the provinces. Before the war a certain amount of research work was carried out, but it is now realized that the very small amount of money that could be diverted to such activities would be unlikely to produce any worthwhile results. Thus the Society acts as a focal point for those interested in astronautics, and its journal and meetings as a clearing-house for ideas. When space is finally conquered it will be found that the B.I.S. will have played an important part in arousing an enlightened interest in space-flight in layman and technician alike.

J. H.

**The registered office of the British Interplanetary Society is at 12 Bessborough Gardens, London, S.W.1. The secretary is Mr. L. J. Carter, A.C.I.S.*

NEW DE HAVILLAND CANADA FACTORY OPENED

ON September 29th the new factory of the de Havilland Aircraft of Canada, Ltd., at Downsview, outside Toronto, was formally opened by the Rt. Hon. C. D. Howe, Canadian Minister of Trade and Commerce and Minister of Defence Production. Sir Geoffrey de Havilland and Mr. F. T. Hearle, both founder directors of the de Havilland enterprise, and Major F. B. Halford, chairman of the de Havilland Engine Company, had travelled from England for the ceremony.

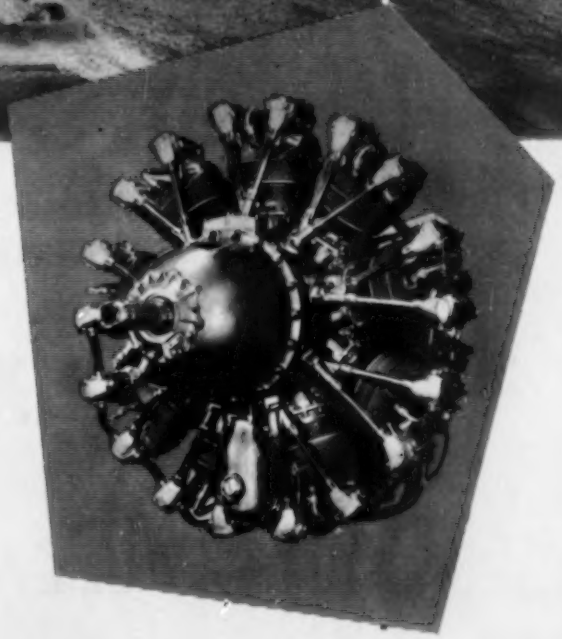
The new factory and servicing base is situated in the south-west corner of Downsview aerodrome, on land allocated by the Crown when it became necessary to exclude civilian activity from the immediate area occupied by the Royal Canadian Air Force, who are joint users of the airfield.

The new factory is one of the best-equipped in North America, with a floor area of 600,000ft. Present activities of D.H. Canada —as was related in some detail in our recent Commonwealth Aircraft Industries number—include the production of the Beaver and Otter, and the Grumman S2F anti-submarine aircraft for the Royal Canadian Navy. A large servicing department is also maintained at Downsview, where overhauls are carried out on Dove, Heron and Comet aircraft operating in Canada. The engine division overhauls and tests Ghost, Goblin, Orenda and J47 engines, as well as the Gipsy range of piston engines and all types of D.H. airscrews. It has recently become permissible, also, to announce the existence of a guided weapons division.

The opening ceremony at Downsview included a tour of the new factory, a flying display by Chipmunk, Beaver, Otter, Dove and Heron aircraft, and addresses by Mr. Howe, Sir Geoffrey de Havilland, Mr. F. T. Hearle and Mr. P. C. Garratt (managing director of D.H. Canada).

A general view of the new Downsview plant. In the group, Sir Geoffrey de Havilland (left) is seen with Mr. C. D. Howe and (right) Mr. P. C. Garratt.

Reliability



Powered by an ALVIS LEONIDES Engine, the Hunting Percival Provost is the standard basic trainer for the R.A.F. In the services, as in commerce, the Leonides has proved its outstanding reliability. 550 b.h.p., 9-cylinder air-cooled radial engine. Weight complete 796 lb. Power/weight ratio 1·45 lb. (0.657 kg.) per b.h.p. Overall diameter 41·5 inches (105 cm.).

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LEONIDES

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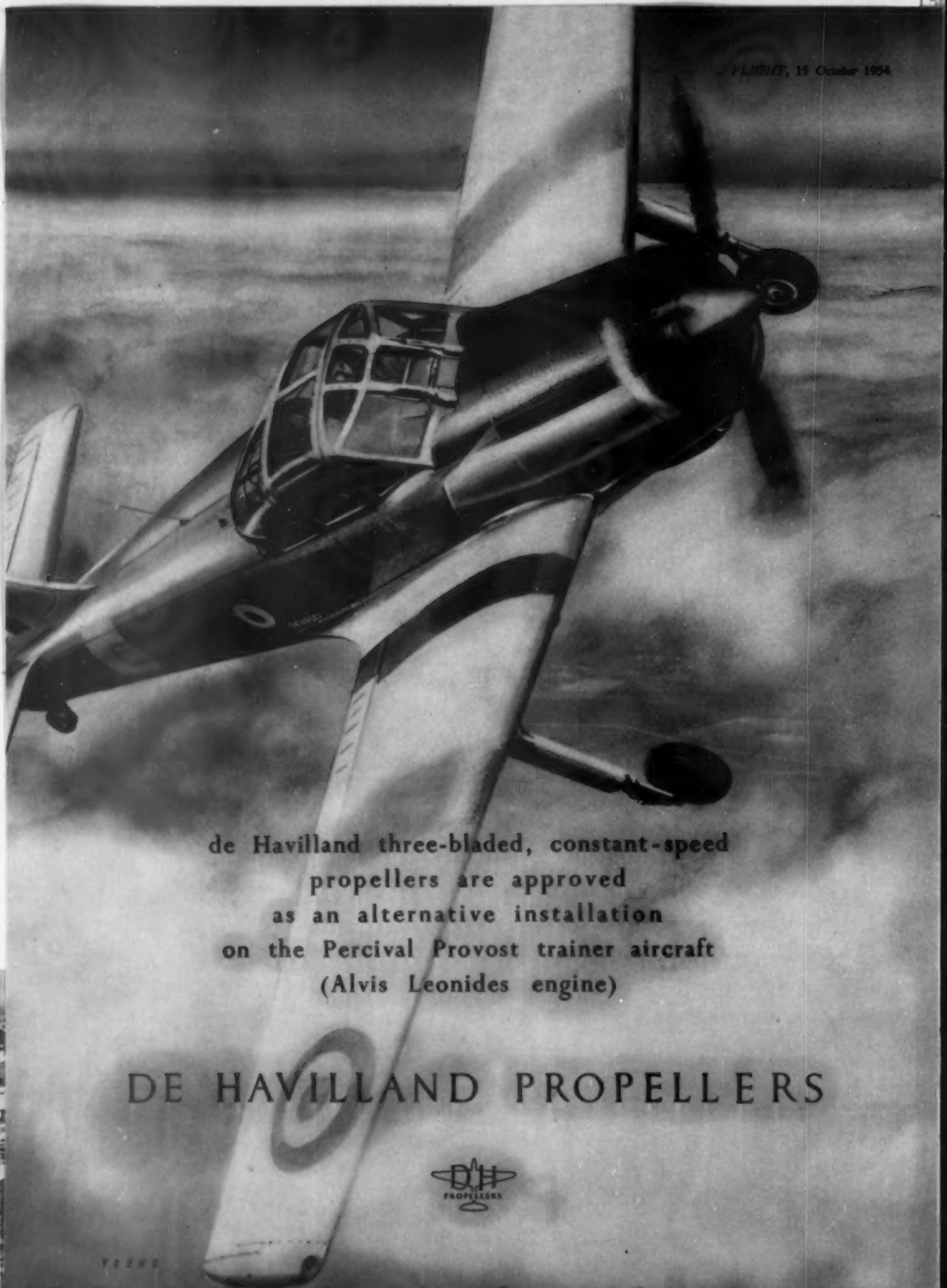
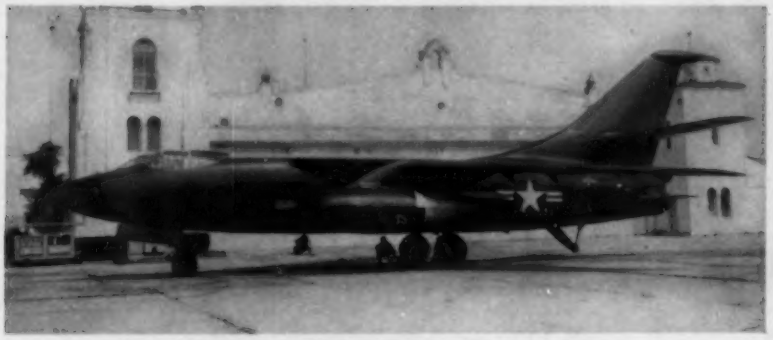


de Havilland three-bladed, constant-speed
propellers are approved
as an alternative installation
on the Percival Provost trainer aircraft
(Alvis Leonides engine)

DE HAVILLAND PROPELLERS

D H
PROPELLERS

AIRCRAFT INTELLIGENCE



The size of the Douglas A3D-1 Skywarrior (top) is emphasized by the servicing crew. This machine weighs over 75,000 lb and is thus more than twice as heavy as any other carrier-based aircraft. Both it and the Douglas AD-5N, above, are discussed on this page.

U.S.A.

Douglas AD-5N Skyraider. Illustrated above is one of the later types of Skyraider; the AD-5 and AD-6 are still in large-scale production (ten years from the time of initial design) and perform a multitude of tasks. These newer aircraft have a broad cockpit seating two side-by-side, and direct communication is possible with the rest of the crew, or passengers, further aft; another modification is the taller vertical tail. The AD-5N is a night attack machine, and the example shown is fitted with (under the wing, from port to starboard) racks for six HVAR rockets, a strike-radar pod, a 150- or 300-gal. fuel tank, a massive search-radar container, and racks for six more HVARs. Further stores can be carried under the belly. Each new Skyraider is now supplied with conversion kits to permit its adaptation to a number of rôles; as a transport, ten seats can be fitted, in addition to those on the flight deck. The engine remains a Wright R-3350 Cyclone.

Douglas A3D-1 Skywarrior. These aircraft are now being delivered from the El Segundo plant. A production machine (No. 130356) is illustrated above. Powered by a pair of podded Pratt and Whitney J57s, the Skywarrior will equip squadrons to be based in the new *Forrestal*-class carriers; until these huge ships are commissioned, the units will be shore-based. The fully-glazed, pressurized flight deck houses the crew of three—captain, second pilot/bombardier and navigator/gunner—the latter being responsible for the radar-directed twin-20mm barbette in the tail. All three units of the undercarriage fold into the fuselage, and the wings and vertical tail fold for carrier stowage. Hydraulically actuated door-type speed brakes are fitted and the whole belly is occupied by a cavernous weapons bay. Search radar is carried in the nose. At another Douglas factory (Long Beach), a land-based variant of the A3D is in production for the U.S.A.F. Styled B-66 or RB-66, it is heavier, has an opaque roof to the flight deck, a revised form of wing and is powered by a pair of Allison J71s.

Douglas A4D Skyhawk. The latest news of yet another Douglas Naval attack machine—the Sapphire-powered, transonic Skyhawk—is that the third prototype has flown, and that this embodies a number of modifications resulting from experience with the first two machines. One alteration is an increase in the static ground angle obtained by lengthening the nose leg. Carrier take-offs are expected to be improved thereby, although actual carrier trials are yet to come.

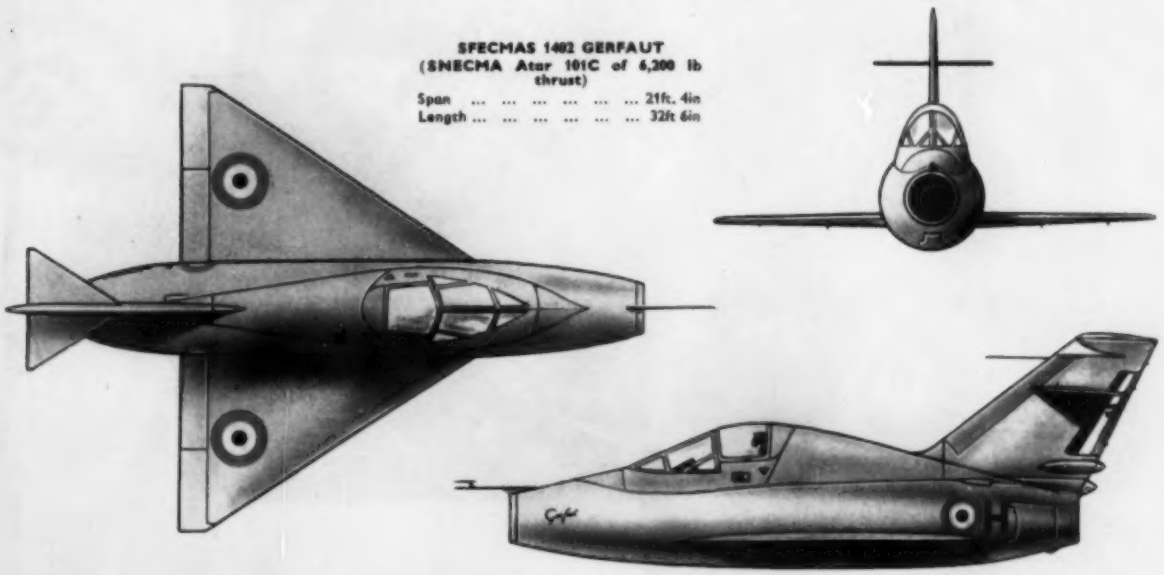
France

Dassault Mystères. Both the Mystère IVB single-seat intercepter and IVN all-weather fighter are powered by the Rolls-Royce Avon RA.7R, with afterburner. Flight testing of these aircraft is now virtually finished, and Dassault suggest that the IVN is the first two-seat aircraft to have sonic capability in level flight. A much higher performance still is expected of the Mystère XX (Avon RA.14 series), which is intended for a level Mach number of 1.3. It will fly next spring, together with the new Dassault delta-winged Type 550 light supersonic fighter.

S.O.4050 Vautour. Trials with the first two (Atar-powered) Vautours are progressing well, and the first aircraft (a two-seater) is giving good results with a new French C.S.F. radar equipment of great transient output power. The third machine, with Armstrong Siddeley Sapphires, promises to be supersonic on the level, and an unconfirmed American report speaks of French interest in the Pratt and Whitney J57 as a future Vautour engine.

SFECMAS 1402 GERFAUT
(SNECMA Atar 101C of 6,200 lb thrust)

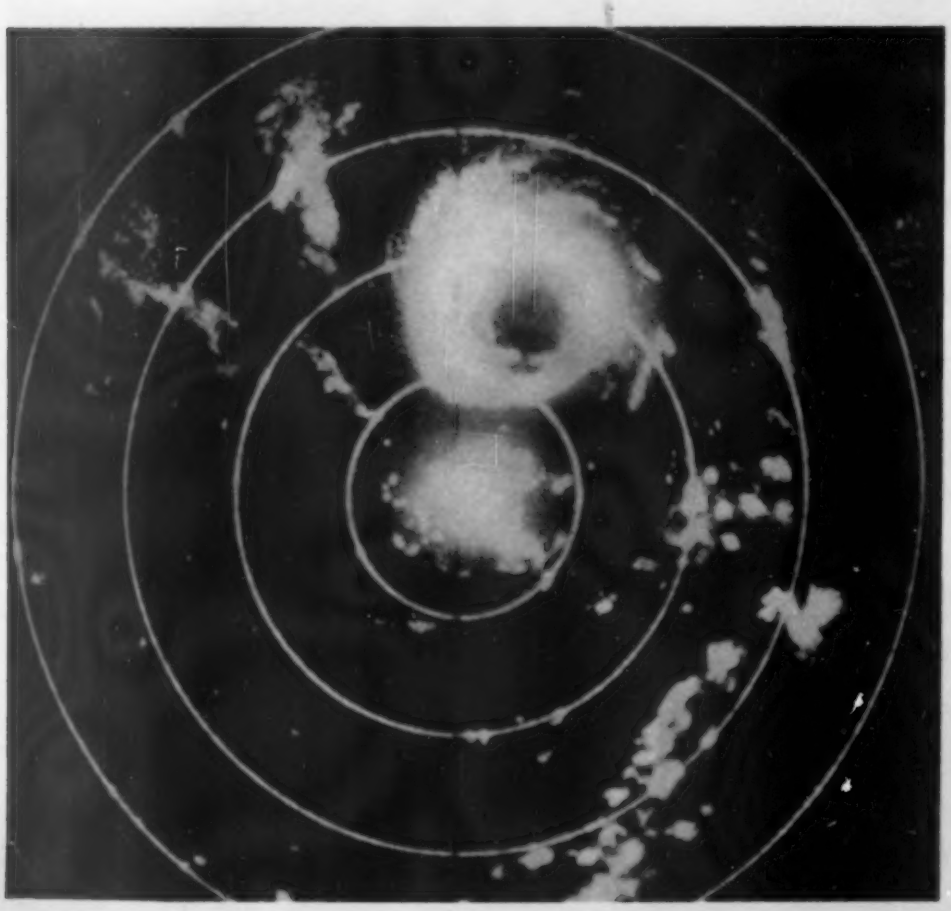
Span 21ft. 4in
Length 32ft 6in

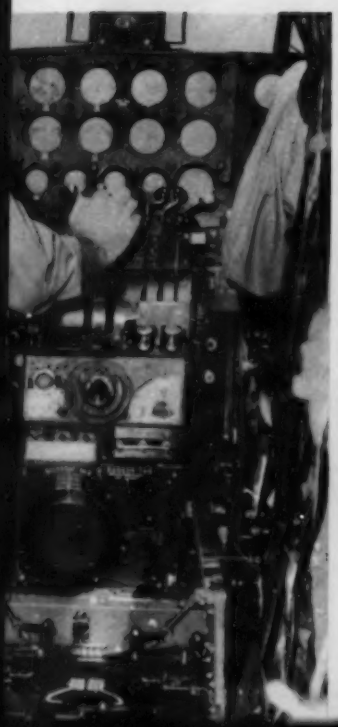


FLIGHT
15 *October* 1954
584 - 585

HURRICANE - HUNTERS

THAT tempestuous young lady, Hurricane "Edna," recently became the focus of much attention and concern along the eastern coast of the U.S.A. The United States Navy, not unknown in the past for its alert interest in the fair sex, upheld long-established Naval tradition by training its eyes on Edna and then following her. Edna was only one in a succession of hurricanes tracked by the Neptunes of Airborne Early-warning Squadron Four, whose activities are illustrated on these pages. Working in close co-operation with the Air Force, the U.S. Weather Bureau, commercial aircraft and ships in collecting data, the squadron passes on its information to "air weather central." Here the reports are analyzed, and forecasts and storm warnings given to cities and towns along the coast. A regular part of the patrol work performed by the Neptunes is to fly into the central "eye" of a hurricane, and to follow it along its course to measure its force and direction. By thus investigating what most pilots avoid at all costs, information and warnings have been given which have certainly saved many lives and avoided the loss of much property. Special equipment fitted to the Neptunes includes the APS-20A type search radar, as installed in R.A.F. Neptunes and R.N. Skyraiders.

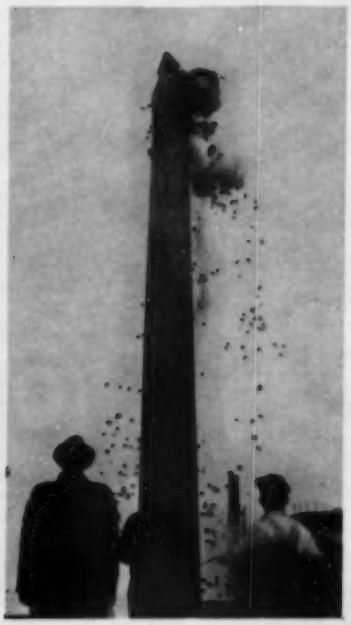




In the heading photograph on the opposite page, a Lockheed P2V-3W sets out from its base at N.A.S., Jacksonville, Florida, for a reconnaissance flight over tropical waters in search of an impending hurricane. Extreme left, an actual photograph of the radar tube display, showing clearly the hurricane just above the centre of the screen. Above, an impressive picture of the storm-torn seas in the area of Hurricane "Carol," with a merchant ship finding the going rough. Left and right, two interior views of the Neptune. In the cockpit, the auxiliary fuel-control panel is located in the floor below the rudder and aileron trim tabs. In the fuselage view, a crew-member is braced to take an oblique photograph of the hurricane.

Helicopter Versatility

THE varying nature of the duties which the modern helicopter can undertake is exemplified in these photographs from Scandinavia. Shown are forest spraying; mail delivery; a rescue machine equipped with an enclosed stretcher; and a spectacular demolition of a factory chimney achieved by means of a cable and grapnel. The aircraft featured in the majority of these views are the Bell 47-Ds operated by Ostermans Aero from Bromma, Stockholm.



FLIGHT
15 October
1954

Weapon Training in the Basic Stage

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- **Individual sights enable the instructor to demonstrate and assess correct firing techniques, with guns, bombs and rockets.**

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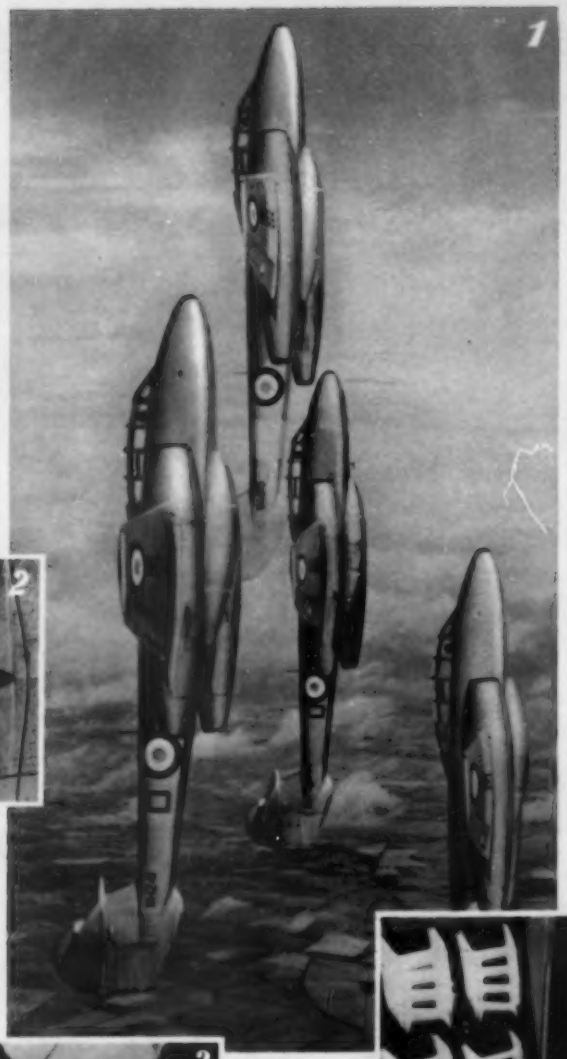
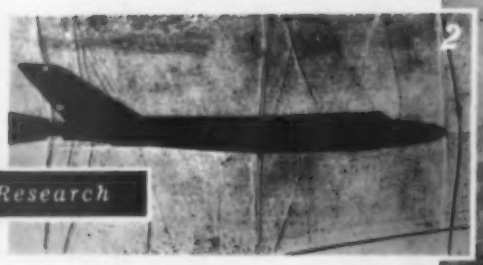
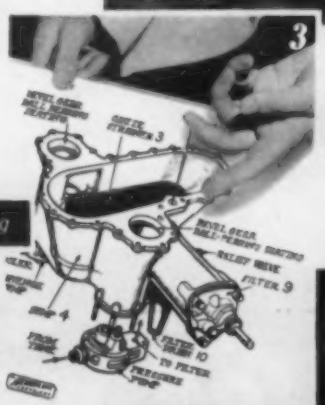




Research

In research and development, in design and production, photographic methods play a vital part—and in all these fields, the aircraft industry relies more and more on Ilford photographic materials.



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ZOOLOGICAL PASSENGERS

Animals as Airline Payload: Some Notes on Care, Food and Comfort

By JOHN SIDNEY

Trunk route: one of five young elephants, en route from Karachi to London in a B.O.A.C. York freighter, seems happy enough.

THE carriage of livestock by air by British airlines has expanded so greatly in the post-war years that recently B.O.A.C. claimed "one in every seven passengers has four feet." Last year the Corporation carried 50,000 animals as against 305,000 human beings. The proportion would have been higher if birds, fish and reptiles had been included for, all told, 230,000 creatures were carried in 1953. B.E.A. carried about 100,000 creatures last year.

The immediate post-war years saw British and American airlines seeking to capture some of the new Noah's Ark freight business which K.L.M. Royal Dutch Airlines had pioneered in the 'twenties and developed between the wars. K.L.M. had carried out one of the first experimental flights in 1923, when a prize bull was flown to an agricultural show.

Some indication of today's air traffic is given by the figures recorded at the R.S.P.C.A.'s new £20,000 animal hostel at London Airport, where 323,054 "guests" were received during 1953. They included every type of animal, bird, reptile, fish and insect, from elephants to bees. Almost the only animal not received at the hostel was the giraffe, and that merely because no freighter is yet in service with sufficient headroom for these animals.

The animal guests at the London Airport Hostel included those embarking and ending their journey at London and those in transit. This third class is by far the largest, and their most frequent destination is the U.S.A.

B.O.A.C. flies a load of animals from the East in to London every week-end. The Corporation's York freighters operate a regular once-weekly service in each direction between London and Singapore with intermediate stops at Tripoli, Cairo, Bahrain, Karachi, Delhi, Calcutta and Bangkok. On their outward flights from the U.K. these services carry air cargo of all descriptions for destinations along the route and pick up consignments at their intermediate points of call. On the return flights from the Far East the bulk of the traffic is animals, uplifted mainly from Bangkok, Calcutta, Delhi and Karachi. Sometimes the Yorks deviate from their normal routing in order to deliver animals direct to points in Europe.

Monkeys, birds and tropical fish are the most common travellers on the Yorks from the East. Sometimes as many as 5,000 monkeys are carried in a flight, most of them bound for United States zoos and research laboratories. But larger animals, including elephants and lions and tigers, are frequently carried by B.O.A.C. and other lines. Regent Park's *Dumbo* was one elephant carried here by air. *Mohini*, a rhinoceros, now at Whipsnade Zoo, was air-freighted from Calcutta.

Some idea of the variety carried is given by this breakdown of 37,140 creatures received at the R.S.P.C.A.'s hostel during one recent month:—

Monkeys ...	3,289	Pandas ...	1	Budgerigars	17
Mongoose ...	4	Storks ...	2	Parrots ...	6
Squirrels ...	8	Flamingoes ...	25	Myna birds	1,560
Hamsters ...	5	Turkeys ...	50	Snow cocks ...	2
Dogs ...	110	Secretarybirds	15	Pheasants ...	3
Cats ...	11	Goslings ...	16	Java sparrows	18
Bears ...	2	Chickens (pedigree)	1	Waxbills ...	660
Wolf cubs ...	3	Frogs ...	4	Starlings ...	10
Lions ...	2	Pythons ...	1	Parakeets ...	100
Tigers ...	2	Snakes ...	1	Finches ...	30,160
Crocodiles ...	1	Canaries ...	651	Bul-buls ...	400
					37,140

B.E.A. carries a heavy traffic in goldfish from Bologna, Italy, and in dogs from all over Europe. From time to time it flies circus animals and does a regular run from the South of France with leeches for London hospitals. The Corporation mainly uses Pionairs for this work, and occasionally Vikings.

The veteran Avro York, with its high wing and tailwheel undercarriage, is particularly useful for freighting livestock as its configuration is a great asset for loading and unloading. The aircraft are completely stripped inside and are fitted with strong floors provided with numerous anchoring points. Large double doors are fitted. At a maximum all-up weight of 68,000 lb the Yorks can carry approximately seven and a half tons of cargo.

The total length of the fuselage is 78ft 6in, and the length of uninterrupted space available for the stowage of freight behind the crews' quarters measures over 47ft. The width varies from 7½ft at the widest point to 4ft at the narrowest. Maximum height is 8ft. The capacity of this compartment is 1,939 cu ft and the usable floor area just under 300 sq ft. This roomy fuselage has enabled B.O.A.C. to carry bulky and heavy consignments of livestock. During 1952, for instance, 18 young elephants were flown from Bangkok to Europe and on one occasion five of them travelled together in the same aircraft. The Corporation has evolved a simple and effective method of "caging" elephants. Boards are first laid on the metal floor and stalls made from planks of hard wood are constructed facing fore and aft along one wall. Metal trays filled with sawdust are used as "floor covering." When the five elephants travelled together three such stalls were joined end to end along the starboard side of the aircraft forward of the double doors and two further stalls were fitted at the rear. The space opposite the doors was kept free during loading and

Airline passengers sometimes complain of being "herded": the elephant—one of those referred to above—could have had no complaint on that score.

The West Highland Terrier was in the export freight shed at London Airport en route to Basle; the consignment, for Whipsnade Zoo, of penguins had arrived at Northolt by B.E.A. from Hamburg; and the appealing leopard cub, seen in a B.O.A.C. receptionist's arms, was from India.

ZOOLOGICAL PASSENGERS . . .

unloading to give room for the elephants to manœuvre into their stalls and during flight this area was used to store supplies of food and drink. Seats for the attendants were fitted one behind the other to the floor points on the forward port side of the fuselage leaving a narrow gangway between the seats and the stalls.

During the loading at Bangkok all the cross-members were removed from between the three forward stalls. The first elephant, occupying the forward position, was led through the two intervening stalls and the cross-members dividing the front stall from the middle one were re-positioned. The second elephant was then led into the middle of the three stalls and the cross-beams dividing it from the third one were also fixed into position. The third elephant went straight into the stall nearest the double doors and again the cross bars at the end were bolted in place. A similar arrangement was used for the two remaining stalls in the rear of the aircraft.

A slightly different system was used in 1951 when B.O.A.C. flew 32 polo ponies from Baghdad to the U.K. Four flights were made, eight ponies in horse-boxes having been carried on each journey. The animals were loaded into their boxes before boarding the aircraft and each box was then manhandled into the fuselage by local labour. Once inside the aircraft the boxes were positioned in accordance with a pre-arranged plan and securely lashed to the floors and walls.

The Yorks have also proved to be very suitable for the carriage of racehorses. Here again loading is greatly simplified by the double doors, a motor horse-box being backed up to them and the horse walking direct into the aircraft along a ramp.

In addition to the regular consignments of animals travelling on the York and Pionair freighters, provision is made for the carriage of some livestock on normal passenger services. This applies mainly to domestic pets and small creatures, such as day-old chicks. Wild animals are never, of course, carried in the same aircraft as human passengers.

The double-decker Stratocruisers which operate B.O.A.C.'s standard services on the North Atlantic routes have spacious freight-holds on the lower deck, where quite large animals can be accommodated if necessary. Air travel is of value to breeders of Siamese kittens who export from Britain to all parts of the world, and air cargo facilities were recently utilized by British and American herpetologists—frog collectors—wishing to "swap" specimens.

In the post-war years animal dealers, zoos and circuses were quick to anticipate the advantages of air travel for animals; journeys were short and took but a fraction of time required by surface travel.

But at first, anticipation outstripped practice. Mortality and sickness were high among livestock, simply because not enough was known about the conditions under which they should travel. Draughts and sudden changes of temperature brought on pneumonia in birds and animals—particularly in monkeys; overcrowding and unsuitable crates and containers brought more deaths. R.S.P.C.A. officials at London Airport frequently would pull out 500 dead or dying birds from a consignment of 2,000; up to 50 monkeys would be found dead or dying among a consignment of 1,000. There were many deaths, also, among certain breeds of dogs.

Alarmed, airline companies went into conference with the R.S.P.C.A. The Society agreed to act as a clearing house for knowledge gained and to undertake research into the problems. It would also undertake to build the London Airport hospice to receive animals delayed on their journeys and in need of food, lodging, exercise, first-aid or veterinary attention.

This hospice comprises a central hangar-like building into which vehicles containing cages of animals may be driven. The building is heated by thermostatically controlled tubular electric heater units, and on one flank are ranged blocks of quarantine and non-quarantine kennels and catteries with appropriate runs. On the other flank is stabling with loose boxes and stalls opening on to an enclosed paddock. Fronting the kennel side of the building, and looking out on to the airport, are the offices, pharmacy and surgery. On the opposite side fronting the stable block are the kitchen, forage stores and larder.

This hospice is the first of its kind and, hope the R.S.P.C.A., the prototype of many others. For some years K.L.M. have been operating something rather different—an "animal hotel" at Schiphol in Amsterdam.

The admiration of animal exporters and collectors all over the world, the London Airport hostel has undoubtedly made a considerable contribution to the health of air-travelling animals since it opened just under two years ago. Of the 37,140 creatures which passed through the hostel in one recent month the R.S.P.C.A. reported only eight deaths—of seven finches and one monkey.

Research carried out by British airlines and by the veterinary surgeons of the R.S.P.C.A. has also helped greatly. Many deaths occurred at first among greyhounds, which became hysterically excited, had apoplectic seizures, and succumbed to ruptures of blood vessels in liver and brain. R.S.P.C.A. surgeons finally found the cause of the intense excitement—and with it, the remedy. The greyhounds had been placed in boxes very much like the traps in which they were put before a race. When the aircraft engines started up, they took it to be the sound of the mechanical hare and became hysterically excited. Today greyhounds are despatched in slatted containers so they can see out, and an attendant stands near to reassure them when the engines start.

Most dogs take well to air travel, but it is unwise to send any dog which is under six months of age. "Dome-headed" dogs, such as bulldogs, boxers and pekingese, are bad risks owing to their excitable nature and respiratory difficulties in the tropics and at altitude. B.O.A.C. has an amusing story of a steward who had to climb into an oxygen tent with a nervous bulldog, midway over the Atlantic. Cats travel well, and are rarely airsick. As a rule, dogs and cats travel in boxes or baskets lined with blanket material and are fed by the steward or stewardess in accordance with instructions supplied by the owners.

For nervous dogs and cats the R.S.P.C.A. has found a very successful homoeopathic remedy, Borax 3X. This is a mild sedative and has been used by the R.S.P.C.A. on the night of November 5th to quieten pets made frenzied by the noise of fireworks.

Birds, generally, are good travellers, but day-old chickens used to travel badly at first and the R.S.P.C.A. hostel had to treat many

for pneumonia. Packed in square-shaped containers, the tiny birds crowded into the corners, got overheated and caught chills. The R.S.P.C.A. now urges the despatch of day-old chicks in circular, and therefore cornerless, containers.

Airlines have learnt the importance of not subjecting animals to extremes of temperature or to draughts. When a B.O.A.C. freighter arrives at London Airport care is taken, particularly in the winter, to ensure that the animals shall not suffer sudden change of temperature during unloading. Before the arrival of an "airborne zoo" the temperature of a covered van waiting on the tarmac is raised with warm air from a ground heater unit which is also coupled to the aircraft immediately it comes to a standstill. The animals are unloaded as quickly as possible so that they shall not be exposed to the cold, and taken to the R.S.P.C.A. hostel—where the heating bill per quarter often runs as much as £100.

At intermediate stops along the route where the animals remain in the aircraft overnight warm air units are coupled to the aircraft heating system so that the temperature inside the aircraft may be kept constant.

Airlines, too, have learnt much about the loading of livestock in planes. Mammals, they find, are best carried in semi-darkness, which they find more restful. But birds must be stowed facing the light, because they will not eat in the dark.

Much has been discovered about the various types of cage required for different animals. Containers must be "nose- and paw-proof." Oblong boxes are recommended, so that in the event of any shaking during handling, or any motion of the aircraft, the animal will receive a certain amount of support; in a square box it will slide from side to side. Crates must be just big enough for dogs to stand upright to turn round in. If the container is too big the dog runs the risk of injury in bumpy conditions.

While it is desirable that animals should have adequate room to move about, monkeys prefer to huddle close together.

Partridges and pheasants are given to jumping and this habit might lead to injuries to their heads against the roof of their container. A piece of canvas, therefore, must be stretched tightly across the box about two inches below the solid roof; or alternatively, the roof must be padded with a soft material such as cotton or kapok. Similarly, sacking or felt padding must be used in cases containing pythons, anacondas and corais snakes, because their skins and noses are soft and easily damaged.

Anthropoid apes require particular attention. They like to have blankets in which to wrap themselves during the journey—and, lacking the companionship of others of their own species, they need the company of human beings to keep them happy. Left to themselves they are inclined to pine.

Some idea of the personal attention which the animals receive is given by an incident which occurred when two orang outangs were travelling from the Far East to North America. They had to change aircraft at London Airport and had several hours to wait before continuing their journey. One of them appeared to be a little off-colour, so he was taken to a nearby pet shop for expert attention during the "stop-over." When the airline officials went to collect him a few hours later they found the orang outang, completely recovered, comfortably seated in an armchair in the pet shop owner's lounge, with a blanket around his shoulders, a cup of tea in one hand, and his eyes glued to the television set!

All B.O.A.C. security wardens are trained in animal care. Recently warden R. Chennells earned himself the nickname "monkeys' midwife" on a recent freighter flight from the Far East. He was travelling as attendant in charge of a consignment of 700 monkeys when 12 of them decided that the interior of a York flying at 10,000ft over India was as suitable a place as any for a maternity ward. Mr. Chennells officiated throughout and on arrival at London Airport was able to report that "mothers and children were doing well."

The transport of fish has provided a number of problems, one being that at 20,000ft the oxygen content of water is reduced to half of the figure at sea level. One solution of the problem has been to send fish in water contained in polythene (plastic) bags which are sealed after oxygen has been pumped in. This is a recent development from the "pressure can," a pressurized container designed by B.O.A.C. cargo experts and the Singapore Fisheries Department. Roughly the size of a four-gallon petrol tin, the can has a screw-thread glass top and two nozzles to which air lines can be attached. It can be sealed off at will. When the fish begin their journey, they are placed in water in the can and oxygen is pumped in through one of the nozzles. When a suitable volume of water has been expelled by the oxygen, the supply is cut off and both nozzles are closed. As many as 500 small fish have been canned together in this way. They can live in such conditions for five days without the need for repacking.

Both the plastic bag and the pressure can have proved very successful in air-freighting tropical fish. Bag and can are insulated, generally by Onazote, to retain the temperature of the water.

Correct feeding of livestock in flight is important. Three meals a day of bread and butter with jam or honey, fruit and greens are provided for orang outangs, gorillas and chimpanzees. Lumps of sugar and pieces of cake are recommended for keeping them happy between meals. Beasts of prey such as lions, tigers and panthers, should be fed once a day, preferably late in the afternoon, and their requirement is 1½ kg of raw meat for every 30 kg of live weight. Crocodiles present few problems *en voyage* as no food is required for up to six days and they are quite happy provided they are watered daily with a hose.

Frogs, toads, newts and salamanders do not drink, but they must always be kept damp, otherwise they are unable to breathe through their skins, when they quickly "dry up" and die. To maintain a moist atmosphere, damp white blotting paper or damp sponges must be used. Very large frogs require special treatment. As they are liable to jump at the lids of travelling cans and damage their noses they must be packed in wooden tubs with sacking covers and two inches of fresh water at the bottom.

On more than one occasion animals and birds have been known to keep airline attendants unnaturally busy. On a recent Saturday afternoon B.E.A. landed ten penguins at Northolt and found that the birds could not be delivered until Monday. Over the week-end 2 cwt of fish were fed to the penguins—and every single fish had to be tossed into the air before the fastidious creatures would eat it.

AMERICA'S AIRCRAFT EXPORTS

THAT Holland, France and Britain, in that order, have been the largest buyers of American aircraft during the last seven years is shown in a special report issued by the U.S. Aircraft Industries Association.

Holland was the best customer of the U.S. aviation industry with purchases in that time worth $55,680,000 (£19,875,721); France was second with purchases totalling $43,796,000 (£18,553,000)), of which $39,962,000 (£14,260,000) was paid for 35 airliners. All but a small fraction of the total paid by Holland was for passenger aircraft.

The British Commonwealth is included in the report as a "seven-area joint buyer." The seven areas are Britain, Australia, Canada, South Africa, India, Pakistan and the Bahamas, which during the seven years bought aircraft and spares and equipment worth a total of $49,172,000 (£17,550,000).

In all, the United States exported aircraft, spares and equipment worth $2,534,000,000 (£905,000,000).

The report, presented by Mr. John Payne, who is the A.I.A.'s export director, remarks that "continued U.S. domination of the world aircraft market is indicated by recent studies showing that U.S.-built planes are at work today in 103 countries."

GANNET with a NORTHERN ACCENT

The First of Many from Fairey's Stockport Factory

THE present importance of Fairey Aviation's northern factories was indicated on October 5th on the occasion of a flight demonstration of the first Stockport-built Gannet A.S.1 at Manchester Airport, Ringway. It was revealed later that an increasingly large part of Gannet production was to take place at Stockport (manufacture) and Ringway (assembly and flight testing).

The demonstration flight was made by Mr. David Masters, the company's senior test pilot at Ringway. His impressive performance, which showed extremely effectively the manœuvrability and low-speed qualities of the machine, was watched by Fairey executives and employees from both northern and southern factories, and by civic representatives. Particularly notable was the sharp rate of roll-reversal after one low run.

After the demonstration and a buffet luncheon in No. 6 hangar, Mr. Richard Fairey, one of the company's directors, read telegrams of congratulation from his father, Sir Richard Fairey (chairman and managing director), and the Directorate of Aircraft Production, M.o.S. He pointed out that it was nearly ten years since Stockport and Ringway had produced a production aircraft for Faireys. Tracing the history of the northern factories, Mr. Fairey recalled that Stockport was the first factory in the world ever to produce an aircraft straight off the drawing-board; this had been the Fairey Battle.

Referring to the temporary grounding of Gannets in service with the Royal Navy, the speaker emphasized that the particular trouble encountered had "little to do with the Fairey Aviation Company" (a subsequent report in the *Manchester Guardian* stated that compressor stalling under certain operating conditions had occurred). The problem, he claimed, was one which would be solved very quickly.

Concerning the firm's general production policy, Mr. Fairey stated that design and development of Fairey aircraft would be carried out at Hayes, and would be followed by quantity production at Stockport. He concluded by congratulating management and workers on their achievement in launching the first northern production Gannet.

Short speeches were also made by the Mayor of Stockport, Councillor J. W. Bennett, and by Mr. H. G. Gregory, general manager of the Fairey Company's northern group of factories.

David Masters, senior Fairey test pilot at Ringway, talks with Mr Richard Fairey. "Flight" photograph

It is not generally known that Fairey's Stockport factory was responsible for the design and construction of the Fairey F.D.1 research aircraft demonstrated at Farnborough this year. The factory's record of war-time production, which totalled 3,223 aircraft, included 500 Beaufighters, 661 Halifaxes, and 1,000 Barracudas. In addition, more than 2,000 aircraft were repaired by the group of northern factories. Present production at Stockport includes Firefly 8s, Vampires and Venoms, in addition to Gannets.

It was first announced on October 3rd—although the Admiralty decision had been made and applied more than a month previously—that Gannets in Naval service had been temporarily grounded "on account of improvements which can be introduced on engine and propeller handling characteristics." Production, experimental and development flying and production delivery remained unaffected. The formation of the Navy's first Gannet flight, it may be recalled, took place at R.N.A.S. Ford in April this year, when 703X Flight, as it is known, commenced a series of extensive flying trials under Lt-Cdr. F. E. Cowtan.

Before, during, and after the demonstration flight: (Left, upper) Masters and Fairey passenger John Taylor fit themselves into the roomy, if bulky, machine; (right) a slow run with wheels, flaps and hook down. (Left) Taxying in, WN 370 folds its wings. "Flight" photographs

THE ANSWER TO EUROPE'S AIR DEFENCE PROBLEM

Trends that were unchecked for forty years so increased the size, weight and cost of the standard fighter and the difficulties of its design, production and operation, that few countries have the resources to build or buy the fighters they need for their defence. A halt has now been called, and a new trend started by the Folland Gnat, a light jet fighter with a flying and fighting performance that meets the sternest demands of modern war and provides the answer to Europe's air defence problem.

The following comparisons with the standard fighter illustrate some of the more significant merits of this new type of aircraft.

● MAN-HOURS
Tooling time for production is halved, and twenty-five light fighters instead of five standard fighters can be built in the same number of airframe man-hours.

● COST
Twenty light fighters, fitted with all essential flying, navigational and armament equipment, can be built for the price of six standard fighters.

● FIRE-POWER
The five light fighters produced in the time needed for one standard fighter can bring to bear 10 × 30-mm. cannon instead of the 4 × 30-mm. cannon, or 6 × 0·5-in. machine-guns of the standard fighter.

● HANDLING
With its high thrust-weight ratio, powered controls, and low lateral inertia, the light fighter will have outstanding manœuvrability. Pilots can learn to fly it in less time because of its simplicity and handiness.

● SERVICING
The simplicity of aircraft services and the smaller amount of equipment installed cut servicing time and increase operational strength. All items needing routine attention are sited where they can be reached without trestles or staging.

● MOBILITY
Light fighters can be carried by air freighter, ship or lorry with little or no dismantling, and can be given ample flight duration for ferrying by the use of long-range tanks.

The Gnat and its first prototype, the Midge (pictured above), are private ventures by

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CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

Aircraft for Business

WE have read with interest your recent articles concerning the use of light aircraft by business houses for communications and executive use, as we have been engaged for some time in a campaign to increase the use of such aircraft, and have in fact convinced several concerns of the advantages of operating single and light-twin aircraft. However, the main disadvantage in the operation of such aircraft is the same "sprint, crawl and shuffle" you refer to in the editorial of your September 24th issue. In these days of control zones and airways, the aerodrome shuffle is not only restricted to passengers of commercial airlines clearing Customs aerodromes; the crawl from the private aerodrome to the town centre, if it is not well served by public transport, can be as long as from the town terminal to the airport of a scheduled service.

Nevertheless, with the selection of the right type of aircraft, and a little effort in making arrangements for the use of private land, these disadvantages can be reduced, and a considerable saving of time and money can be made.

It was because of our interest in the development of this field of private flying that we were particularly anxious to secure the agency for the Saab Safir, which, as you know, is an all-metal four-seat fast touring aircraft of a type that hitherto has been unobtainable in this dollar-starved country.

Gatwick, Surrey. M. J. SPENCE,
Aircraft Sales Mgr., Aerocontacts, Ltd.

Profitable Write-off

I WAS interested to read the article "Under Three Flags" in your issue of October 1st, dealing with Constellation G-AHEN which crashed at Filton in 1951; but certain aspects of the article dealing with the "write-off" are not entirely correct.

The price paid for the damaged aircraft was $244,000 and not $100,000. The reason for the write-off was, firstly, that repair would have entailed a delay of the order of 12 months (which did not, at that time, suit B.O.A.C.) and, secondly, that when our estimate for repair was related to the insured value of the aeroplane it was apparent that underwriters would not lose by settling a total loss and then taking over and selling the salvage. It was, therefore, in everybody's interest to treat the aircraft as a write-off.

As a matter of interest, we believe that $244,000 is the highest price ever obtained in respect of salvage of a piston-engined airliner belonging to underwriters.

London, E.C.2. ALAN B. HUNTER,
Chief Tech. Officer, British Aviation Insurance Co., Ltd.

Backward-facing Seats

IN your issue of July 16th, 1954, which has only just reached me, there is an article, "On Going Forwards Backwards," relating to the merits of backward-facing seats. This is an excellent and timely survey of an important topic. However, it does contain two statements which are in error (quite understandably) and which I ask your permission to correct. These are: "To my knowledge, the only airworthiness authority to issue any definite pronouncement along these lines is our own A.R.B.," and "In 1952 the Australian Department of Civil Aviation came out with a proposal to issue a firm requirement . . . shortly afterwards the . . . Minister . . . announced that the proposal had been dropped."

In fact, Australian design requirements were amended in 1952 to include a requirement (not a recommendation) for passenger seats to be of the 12g backward-facing type, and this requirement stands today. Since it strictly only applies to aircraft designed in Australia, and since no local design has reached prototype form in the meantime, this is perhaps an academic point. However, the fact remains that the decision has been taken in Australia.

The proposal that was dropped in 1952 was one to require the transport aircraft then on order overseas by Australian operators to comply with this requirement. It is apparent that the difficulties in this proposal are very much greater than those associated with applying an identical requirement to a design *ab initio*. The position at that time was that the cost of applying the requirement to the aircraft concerned was prohibitive in money and, more important, in delayed deliveries.

One argument against the backward-facing seats was not touched on by your contributor. Although it has little real substance, it has achieved wide currency in America and Australia, and for this reason alone it should be discussed. It goes something like this: "In many crashes the aircraft twists about a vertical axis as it comes to rest, and in some part of its path the passengers turn through 120-180 deg. In such cases the backward-facing seats become, in effect, forward-facing, and pretty rugged, damaging ones at that. This happens so frequently that there is no real merit in facing aft to start with."

The answer to this is very simple and very factual. It is certainly true that many crashes of this type do occur. However, they almost invariably occur when an aircraft skids to a halt over fairly long distances—that is, when the decelerative forces are low. In these circumstances the chances of injury due to decelerative forces are negligible; people are not hurt that way in such crashes, whichever way they face.

Lethal-crash peak decelerations are rarely less than 3g and are usually 6g or more. There is ample evidence that decelerations of such magnitude abaft the beam rarely, if ever, occur. In assessing crash evidence on this point it should be remembered that the strength of fittings in the aft direction is commonly very low, and this is particularly true of the seat-backs of many pre-1950 seats that were designed to face to the front. In all the crash evidence I have studied I have seen only one isolated case of a seat-back failure in an aft direction—and that was a type of seat having a strength of about 1g in that direction. If there was any substance in the argument under discussion, seat-back failures towards the rear would be common.

Whenever the deceleration is forward of the beam, the backward-facing seat gives very much superior protection against "relative motion" injury—not only against the fore-and-aft component of the forces, but also against the side loads that have so often proved serious.

R. R. SHAW,
Melbourne, C.1. Department of Civil Aviation, Australia.

Hearing the Show Commentary

THE fact that your correspondent Mr. J. M. Baker has expressed identical views both in *Flight* and in *The Aeroplane* on the public-address system installed at Farnborough establishes that he is seriously interested in this aspect of the Society's Flying Display arrangements. I think, therefore, that both Mr. Baker and your readers may like to have some additional information on the sound system used this year.

For the first time, a combination of high-powered loudspeakers having accurately controlled directional characteristics was used, together with a sound-delay device. Before deciding on the use of this system, the Society consulted the best authorities in the country. The results achieved were, in general, superior to those obtained on previous occasions, but to some extent the performance of any system designed to operate in the open, on the scale necessary at Farnborough, must be affected by weather. In addition, there are many natural obstacles and buildings which can shield spectators from sound coming from some banks of loudspeakers.

Both the Society and the company responsible for installation of the system have received many complimentary comments on the improvements achieved—a number of them from members of the public who complained last year. The Press has also commented favourably.

H. W. GOODINGE,
Asst. Director, Society of British Aircraft
London, W.1. Constructors, Ltd.

Soviet Jet-propulsion Pioneers

WHILE reading G. D. H. Cole's *Socialist Thought: Marxism and Anarchism 1850-1890* I came across the following passage in chapter XII, page 321:—

"Rysakov, arrested on the spot, and another of the group, a young metal worker named Timothy Mihailov, made revelations about their fellow-conspirators in the hope of saving their own lives, and the police were able to arrest nearly all the active leaders of Narodnaya Volya who were still at large.

Zhelyabov, already in prison before the event, insisted on taking his full share of the responsibility and on being tried with the others who were directly involved in the assassination; and he, Sophie Perovskaya, Rysakov, Timothy Mihailov, and Nikolai Kibalchich, who had prepared the explosives, were publicly hanged after a summary trial without a jury.

Incidentally, this Kibalchich left behind him the plans for a jet-propelled aeroplane, which, unearthed by the Bolsheviks from the police archives, cause him to be proclaimed today in the Soviet Union as the real pioneer of jet-propulsion.

He was a quite eminent technician who worked secretly for the terrorists while pursuing an apparently blameless career."

I possess neither the wit nor the knowledge to comment on the claim incorporated in the above passage, for I am the veriest lay-

CORRESPONDENCE . . .

man regarding the history or workings of anything more complicated than a bicycle.

I feel, however, that the above quotation will interest if not the historian then the literator among your readers.

London, W.14. ARTHUR MOYSE.

Security Veils?

ON page 511 of *Flight* of October 1st, in the account of "Battle Royal," one reads in the last but one paragraph that:—

". . . the camouflage and cover was well-nigh perfect, though 'chaps' were gazing up at the aircraft and giving the show away, as, we were assured, they often do under field conditions."

Could not this "give-away" be overcome by obliging all personnel on the ground to wear a camouflage loose veil? This could be a closer-knit extension of the net which is now worn over the "tin hat." If women can wear veils, and sometimes thick ones, without apparent discomfort so could men; and this would be easier than blacking the face.

Paris, XVIe. H. R. GILLMAN.

Strange Resting Place

THE exquisite articles by Mr. J. M. Bruce on aircraft of the 1914-18 war have prompted me to break into this "letter to the Editor" business for the first time.

I wonder how many devotees (I nearly used that revolting word "enthusiast") of that sort of thing know that a prop-blade from a Sopwith triplane was, just before the 1939-45 war, gracing the altar of a Bulgarian monastry? The blade, mounted on the forward half of the crankcase of the rotary engine, had the reverse-half of the casting set at the tip, the whole thing being highly polished and used as a candlestick.

The monastry is at Batchkovo, north of the Rhodope mountain range in southern Bulgaria. I was told that at the monastry of Rila, near Razlog, over the other side of the mountains, there is the propeller of a Bristol Fighter which, after years of mishandling by various Bulgarian bodies, finally developed curvature of the crankshaft. This prop forms part of the interior decoration of the monastery's church.

There is some question about the triplane. I must point out that my husband, despite assurances by our ferocious informant that the machine was an English "three-stage flyer," remains convinced that the machine was in fact a Fokker DR.1, as the blade is of the laminated type. Perhaps Mr. Bruce could settle the matter?

Could be, of course, that there was more "bull" in our Bulgar than we thought. We did get confirmation, however, that it was some form of single-seat triplane.

Thanks for a magazine that is getting progressively more excellent, and that does seem to pay adequate attention to the finished article.

Invergarry. W.3643.

A Vintage Aircraft Squadron?

I MAY be overstepping the balance a little by raising again the question of preserving examples of the more worthy types of Service aeroplane, but the present apathetic official silence prompts me to offer a suggestion for their economical upkeep whilst these machines remain with us.

Broadly, I would suggest the formation of a "Vintage Squadron" within the Royal Air Force, equipped with at least one each of the Hurricane, Spitfire, Mosquito, Wellington and Lancaster, together with, perhaps, a Beaufighter, Hornet, Tempest and, now that it has been officially withdrawn from use, a Tiger Moth. The Anson and Oxford could join later. Where possible, as in the case of the Spitfire, a flight of three should be maintained for formation aerobatic demonstrations.

Expense would barely enter the problem. For example, the aircraft, being Air Ministry property already, would cost nothing; there would be no depreciation, for each machine must have been written-off the ledgers several times over; and the occupation of an additional hangar on a currently active station would amount to little more than the cost of the occasional electric light required.

So expense, virtually, can be forgotten. With a healthy stock of already-existing spares these aircraft could remain airworthy almost indefinitely at a fraction above fuel and oil rates, whilst their organized appearance at every major air display throughout the country would more than gladden the hearts of the recruiting specialists whose efforts, we hear, bring far from satisfactory results.

This naturally leads us to manpower. It has been offered as one excuse that the maintenance of useless (?) obsolete machinery would divert many skilled men from more useful occupations; but while this *could* be true it *need* not be so. I am quite certain that sufficient men of all ranks and trades could be persuaded back into uniform to get their nostalgic hands onto a Hurricane, while from the pilots' angle I for one would rejoin the Service tomorrow if *guaranteed* a posting to this unit! However, for added economy, as these machines would need to be flown only occasionally and mainly at weekends, suitably qualified and enthusiastic Reservists could make themselves useful and derive great pleasure from doing so.

It is neither expense nor manpower that prevents any action in this line, but complete absence of any enthusiastic spirit at the policy-making end of the tree. Already muddled planning has resulted in the R.A.F.'s lone Hurricane wearing an Oxford's tail-wheel and a Spitfire's mainwheels, though both the legitimate parts still exist at a maintenance unit only two Anson-hours from the Hurricane's home.

A few months may make all the difference between success and failure. Eight Spitfire 16s operate from Exeter. Coastal Command use five or six Lancasters for heavy-conversion duties, whilst the four re-hashed for filming *The Dam-Busters* are still flying. At least two Beaufighters are airworthy at Hornchurch, the "last" (and in fact three or four other) Wellingtons remain intact; a handful each of Mosquito 3s and 35s are still in service; and I was surprised to see a Tempest 6 airborne less than a month ago. Hornets certainly operate in Malaya, but I cannot vouch for the existence of any other than Naval versions in this country.

How much greater respect many of us would have for those in power at Air Ministry if some definite and honest plan of action were to be publicly announced! The nation and the service could benefit considerably.

Windsor, Berks. DAVID F. OGILVY.

"Golden Horn's" Radio Officer Remembers

AS the survivor of the accident to the Short G-class flying-boat *Golden Horn*, I wonder if you are interested in further details amplifying those in the letter in your issue dated August 20th.

A contributory cause of the accident was a serious fuel-system leakage. When the trouble developed on the starboard engine, I saw from the astro-hatch position that petrol was streaming from the rear of the wing, with flames about 30 feet long. These caused the fire damage to the tailplane and control surfaces.

The vision through the windscreen was obscured by smoke which entered through the starboard wing-root. The pilot could not see his instrument panel. We struck the water, porpoised and then dived. The hull broke into sections, the engines fell out and the wings were torn off. After the hull had settled on the bottom of the River Tagus, I escaped through the astro-hatch, which was splintered. I broke surface in a patch of burning oil and petrol. I submerged and swam under to the edge of the patch where I waited until a Portuguese fishing boat picked me up.

Heston, Middx. A. UTTLEY.

For U.S.N. Read U.S.A.F.

MAY I correct an item of information on page 130 of your issue of July 30th, 1954, in which you refer to "a U.S. Navy amphibian" as having rescued the survivors of the Cathay Pacific Airways DC-4 which was shot down off Hainan Island? As other correspondents have no doubt informed you, the rescue was in fact made by a Grumman SA-16 of the United States Air Force Air Rescue Service, flying from Clark Air Force Base in the Philippines.

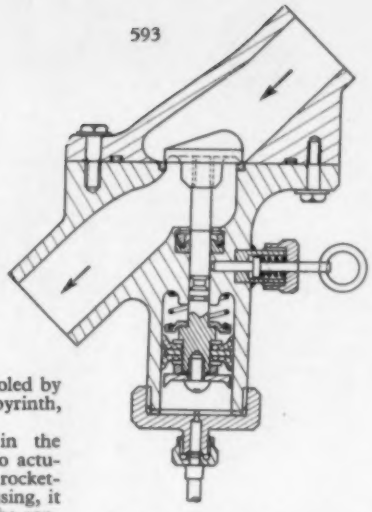
Wichita, Kansas. EDWARD N. TIHEN.

FORTHCOMING EVENTS

Oct.	15.	Rochester Flying Club: Annual dinner and dance, Bearsted.
Oct.	15.	Helicopter Association: "Application of Gas Turbines to Helicopter Propulsion," by J. Brown.
Oct.	15.	The Airlines Ball, Royal Albert Hall, London.
Oct.	19.	R.Ae.S. Graduates' and Students' Section: "The Propeller-Turbine in Airline Service," by T. M. Carson.
Oct.	21.	R.Ae.S. Main Lecture: "The Development of Reheat," by J. L. Edwards.
Oct.	25.	University of Liverpool Engineering Society: Survey of Helicopters, by S/L. A. Armitage.
Oct.	26.	Institute of Transport: Visual aids meeting: films on air transport.
Oct.	27.	R.A.F. College, Cranwell: Rugby v. Oxford University Greyhounds.
Oct.	27.	Institute of Welding: Annual dinner.
Oct.	27.	British Institution of Radio Engineers: Annual general meeting, and presidential address by Rear Admiral Sir Philip Clarke, K.B.E., C.B., D.S.O.
Oct.	28-29.	Institute of Welding: Presidential address by Mr. R. G. Braithwaite, M.I.C.E., and discussions on papers dealing with welding and materials.
Oct.	29.	R.Ae.S. Graduates' and Students' Section: Reception and dance.
Oct.	30.	S.L.A.E.: "Developments in Aircraft Pressurization," by F. W. Michael.
Nov.	4.	Institute of Metals: "Trends in Metallurgy," by Prof. A. G. Quarrell, Ph.D., D.Sc.
Nov.	4.	R.Ae.S., Isle of Wight Branch: Annual dinner.
Nov.	10.	Institute of Transport: Anniversary luncheon.
Nov.	12.	Helicopter Association: "Helicopter Production," by E. J. Boulger.
Nov.	23.	Helicopter Association: Films, in association with the R.Ae.C.
Nov.	25-26.	Institute of Metals: Discussions on papers dealing with titanium and other subjects.
Nov.	30.	Guild of Air Pilots and Air Navigators: 25th anniversary celebrations.

The Industry

CARTRIDGE-OPERATED VALVES



A "one off" cartridge-operated valve designed for a rocket motor test stand. The slow-burning cartridge is housed in the centre of the base cap.

PNEUMATIC rams which contain their own source of pressure are, although a relatively recent development, already in use in several types of one-shot application, both in the air and on the ground. Such rams are attached directly to a high-pressure bottle, the air in which is restrained by a diaphragm that can be burst at the appropriate moment to operate the plunger. Compared with rams pressurized by a conventional pneumatic system, the new arrangement can be made much lighter, cheaper, simpler and more adaptable or flexible in operation.

A Somerset company specializing in development and component work—Willcocks (Clevedon), Ltd.—are now actively developing a system which promises to carry the process even further. They have recently completed a design investigation into a system of valves operated by small cartridges, and consider that there is a case for the use of such units in both static test equipment (for rocket motors, for example) and aircraft, particularly in guided weapons and their development.

The gas pressure for the unit is provided by a slow-burning cartridge (of 0.22in bore at present) filled with cordite, which is fired electrically. The optimum form of ignition has not yet been determined, but development has been carried out using a low-voltage (12 to 24 V) resistance wire; later versions may have a high-frequency spark. The hot gas from the burning cordite is then filtered, and production cartridges might have a fine-mesh filter made integrally with the case. The gas is then admitted directly to the actuator cylinder.

Pressure builds up steadily, and the characteristics of the unit are governed almost entirely by the size of the orifice fitted to the variable jet behind the piston. According to the jet chosen, the air-pressure behind the piston can be controlled to provide smooth operation of the ram. When the piston is at the end of its stroke it is locked by a spring-loaded plunger, and the final movement of the piston uncovers the variable jet, so permitting the cordite gas to escape. The sudden release of very hot exhaust gas has always been one of the chief objections to the employment of cordite cartridges in such applications. Willcocks are developing a heat dissipator which operates on the Joule-Kelvin effect of rapid cooling produced by violent expansion across a fine orifice; the gas is admitted into a lightweight exhaust chamber *via* such an orifice and is then further cooled by passage through a labyrinth, before final venting.

The ram shown in the drawing is arranged to actuate a fuel valve used in rocket-motor testing. In passing, it should be noted that the construction of the unit is not representative of the fully developed equipment, for the latter will be lighter and will also have a quick-acting breech.

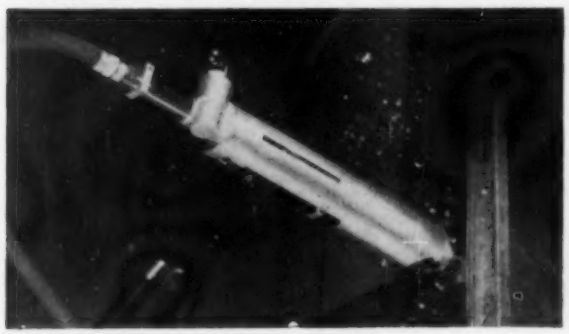
In such an application, the piston is arranged to open the valve against a return spring and also against whatever pressure exists in the supply pipe upstream of the valve. The hot gases in the firing chamber are isolated from the fluid in the pipe by four seals and an air chamber. The fluids which can be handled include all normal fuels, as well as nitric acid and hydrogen peroxide; liquid oxygen itself would require some redesign of the valve.

The basic material of an airborne unit would be light alloy, with a P.T.F.E. lining to increase resistance to corrosion. Sealing is either of an asbestos-like composition (this is used in the piston itself, between mild-steel discs) or of silicone rubber or a proprietary material like Gako. The seat of the fluid valve is of polythene.

In the example shown, the valve can be closed by manual operation of the locking plunger, so allowing the ram to move under the influence of the return spring. There is no objection to the provision of a second cartridge to actuate the locking plunger; in fact, it should be possible to employ a form of revolver cylinder where a number of successive operations are required.

Rack-feed Portable Drill

MODERN structural systems, particularly on large aircraft in which use is made of massive forgings and extruded sections, call for the drilling of considerable numbers of holes of up to perhaps ½in diameter and a depth of 2in or more.



The rack-feed drill supports itself on the jig bush.

For such work in situations where the component is already incorporated and cannot be drilled by a floor-type machine, a specialized type of portable drill is desirable to relieve operator-fatigue; and a tool to meet this requirement has been recently added to the range marketed by Desoutter Brothers, Ltd., of The Hyde, London, N.W.9. Known as the Desoutter pneumatic rack-feed drill, it is provided with a geared hand-feed, and it also incorporates an attachment to anchor it to the bush of the drill jig.

In operation, the tool is applied to the jig and the nose is pushed home into the bush; the tool is then given a quarter turn, whereupon a bayonet fitting on the nose slides under two collars previously attached to the jig by screws, one on each side of the bush. The rack-feed handle is then rotated, bringing the twist drill towards the work; and as it is about to make contact the air supply is automatically switched on by a cam. After the hole has been drilled the reverse process is, of course, put into effect.

Five models are available, with capacities from 5/16in to ½in; respective speeds range from 3,300 r.p.m. to 350 r.p.m. and weights from 6lb to 7lb. The standard stroke is 2in, but a longer stroke can be provided to order.

A Firm at Farnborough

WITH Mr. J. McEwan King, A.R.Ae.S., and Mr. John Love, A.R.Ae.S. (both of King Aircraft Corporation), as co-directors, Mr. W. M. Widgery, F.R.Ae.S., has recently established a new company at Camp Road, Farnborough, Hants, under the title of Widgery Developments, Ltd.

The firm's objectives will be the design, development and production of aircraft and missile ancillary equipment, including such items as electro-mechanical and electro-hydraulic actuators, auto switches, barometric devices and special-purpose valves.

Mr. Leonard M. Broadway, who succeeds Mr. Alonzo Limb as managing director of C. C. Wakefield and Co., Ltd. Mr. Limb, who has retired through ill-health, remains a director.

Mr. Thomas Simpson, A.F.R.Ae.S., appointed chairman and managing director of H. M. Hobson, Ltd., in succession to the late Mr. S. W. Hughes. He was formerly the assistant managing director.

THE INDUSTRY . . .

Export Packing Developments

A LEAFLET lately produced by Export Packing Service, Ltd., Imperial Buildings, 56 Kingsway, London, W.C.2, explains the "on site" packing facilities which the company are now able to offer to the aircraft and other industries. Initial procedure under this system is similar to that already followed at E.P.S. packing centres, i.e., a designer who has specialized in work of a similar nature is sent to make a survey. Proposals are then submitted to the customer as to how the job can best be handled: whether it shall be done totally on site, or partly on site and partly at an E.P.S. factory. Agreement having been reached on the method, a mobile team may be sent; in some circumstances it may bring all the necessary packing equipment with it, but manufacturers' existing facilities are used wherever practicable.

Plastic spray preservation is one of the systems to be used to a considerable degree in the new service.

Incidentally, an important new development in the E.P.S. business was due to take place yesterday, October 14th, with the opening—by Sir Edward Boyle, Parliamentary Secretary to the Ministry of Supply—of a research laboratory to study and develop the scientific packing of aero engines, electrical instruments and other technical equipment. Situated near the main factory at Sittingbourne, Kent, the site will have provision for a permanent helicopter landing ground.

Epoxide Resins Agreement

AN agreement is announced between Aero Research, Ltd., and Shell Chemicals, Ltd., concerning, in the United Kingdom, the patents held by Ciba and Shell in the field of epoxide resins.

This agreement, it is stated, will be of particular value to the paint industry in that it will give freedom under both the Ciba and Shell patents to all purchasers of epoxide resins from either company to sell or use these materials in surface coatings.

In the specialized fields of potting, casting, laminating and adhesives, similar freedom under the patents will be available to customers purchasing epoxide resins from either company for their own use, but not for resale in their original or modified form.

IN BRIEF

Mr. F. W. Lampard has been appointed northern manager of Silentbloc, Ltd., and the Andre Rubber Co., Ltd. His H.Q. will be the office of the two companies at 11, Cloth Hall Street, Huddersfield.

* * *

Much practical information is contained in a new publication by Dawe Instruments, Ltd., 99 Uxbridge Road, London, N.W.5, under the title of *Dawe Instruments in Industry*. Principal contents are Noise and its Measurement, Vibration Analysis, the Ultrasonic Measurement of Wall Thickness, Dynamic Balancing, and Industrial Applications of Modern Stroboscopes.

* * *

Dealing with the methods used by the English Steel Corporation's group of companies in the manufacture of special steels, a new documentary colour film is both informative and spectacular. Versions are now being prepared with commentaries in French, Italian, Spanish, Portuguese, and German. Sixteen-millimetre copies of the film (which runs for 50 minutes) may be borrowed by engineering societies and similar organizations, on application to Mr. R. Muirhead, O.B.E., English Steel Corporation, Ltd., River Don Works, Sheffield, 9.

One of the largest cranes in the range made by Chamberlain Industries, Ltd., of London, E.10, the "Staffa 10" has a 30ft jib, to which another 30ft of extension sections can be added. Maximum safe working loads are 10 tons at 10ft radius with 30ft light-alloy jib (using outriggers) or 6 tons (crane fully mobile). The mechanism is, in general, designed for high speeds and low torques, thus reducing size and weight of components.

R. B. Pullin and Co., Ltd., announce the appointment, as additional directors, of Mr. N. H. M. Steinbeck (right), general manager for the past four years, and Mr. H. M. Whitcombe (left), technical sales manager.

Preparation, characteristics and use of G.E.C. Heavy Alloy in the aircraft industry are described in a booklet lately issued by the General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2. The alloy was the subject of an article in *Flight* of June 4th this year.

* * *

The British Welding Research Association have prepared an informative and well-illustrated booklet explaining their organization and the services which they are able to offer to industry. Copies are available on application to the Director of Research, British Welding Research Association, 29 Park Crescent, London, W.1.

* * *

From the Metal Finishing Division of the Pyrene Co., Ltd., Great West Road, Brentford, Middlesex, come notes describing the use of "Preperite" No. 1, a medium for removing rust from iron and steel, and corrosion products from non-ferrous metals. It can be applied either by brush or by the cold or hot immersion method.

* * *

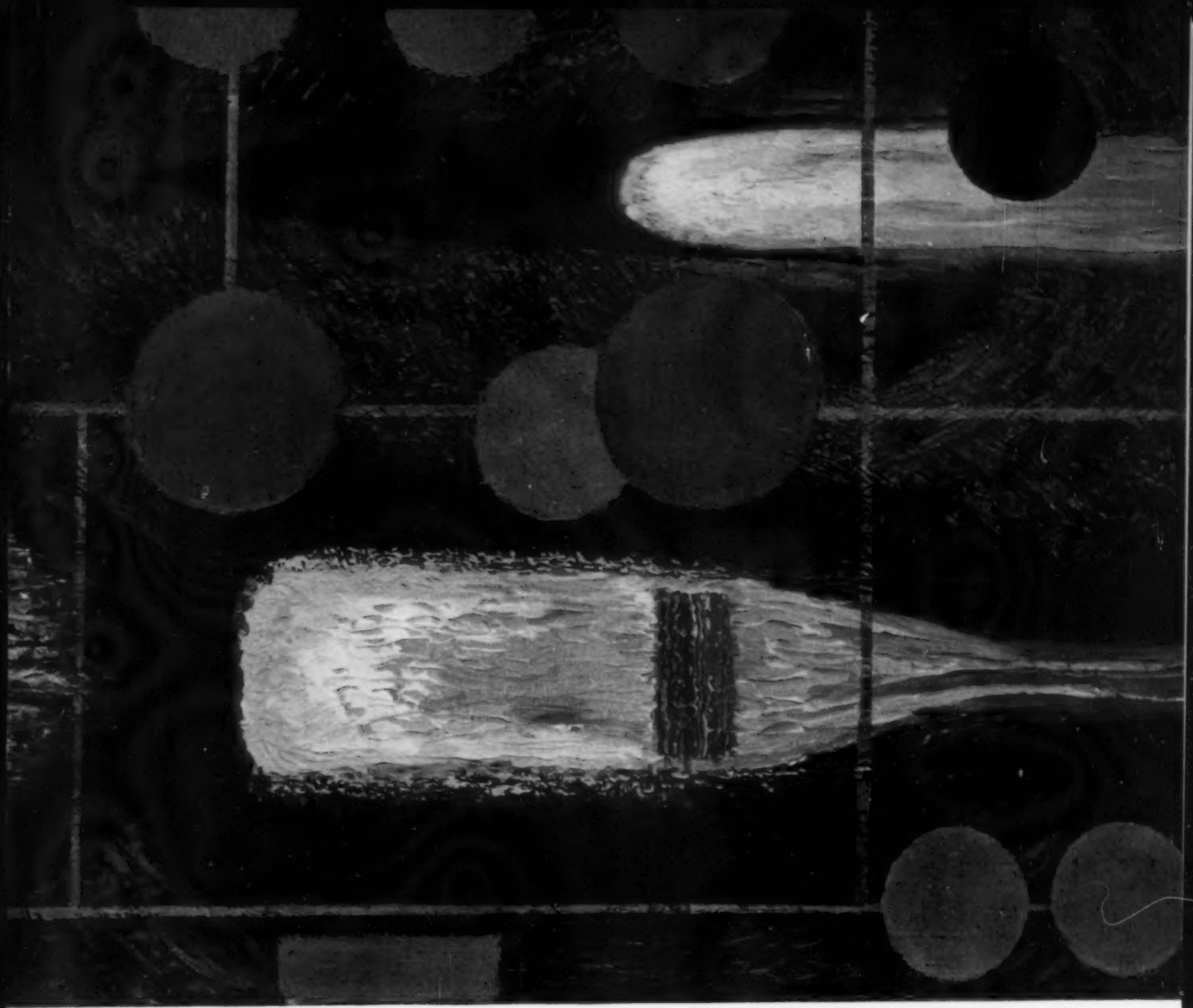
G.E.C., Ltd., have produced two new patterns of heavy-duty electric torch. One, developed from a widely used war-time model, is the BA612 morse signalling torch, with key and removable blue filter. The other, the BA613, is for industrial applications, emergency kits, marine work and general outdoor use.

* * *

In the new office building of the de Havilland Engine Co., Ltd., at Leavesden, extensive use is being made of the latest Holophane tungsten lighting equipment. Some of the offices have 200-watt "Correctalite" fittings, using a slightly tinted blue prismatic glass which gives partial colour correction to the tungsten lamp, blending more naturally with daylight and giving a better black-white definition. The equipment is made by Holophane, Ltd., Elverton Street, London, S.W.1.

* * *

Winston Electronics, Ltd., of Hampton Hill, Middlesex, will in future describe their stabilized voltage control equipment by the names "Constavolt" (for battery charging, etc.) and "Magnetrol" (for rectification, battery elimination and similar purposes). The previous name, "Voltastat," has been discontinued as it bore a similarity to a name used by another manufacturer.



Power Development — Roy Nockolds' latest abstract design for Armstrong Siddeley is an impression of tremendous, searing heat, of the search for ever increasing power, it is a glimpse of the future.

The Sapphire, power unit for no less than nine of the world's most formidable fighting aircraft, is being developed still further; while a special team is working on Rocket Engines, probing and proving the vast possibilities of this new and vital source of power.

★ ***THE SAPPHIRE*** *is being manufactured under licence by the Wright Aeronautical Division of the Curtiss-Wright Corporation in the U.S.A., where it is known as the Wright J-65.*

The Hawker
HUNTER *F.2 fighter*

The Gloster
JAVELIN *all-weather fighter*

★ *The Republic F.84F*
THUNDERSTREAK *fighter*

The Handley Page
VICTOR *crescent-wing bomber*

★ *The*
MARTIN B57 (*Canberra*) *bomber*

★ *The North American*
FURY *fighter*

★ *The Douglas A4D*
SKYHAWK *bomber*

The English Electric
P.1. *fighter*

★ *The Grumman*
F9F-9 TIGER *fighter*

ARMSTRONG SIDDELEY

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These components for the range of pumps designed and manufactured by us are of extreme dimensional accuracy and super finish, and are the operative parts in varying the delivery of self-governing, 2,000 p.s.i., fuel pumps. Three basic pumps cover present engine requirements with deliveries of 460 to 2,800 gallons per hour.

FUEL AND COMBUSTION SYSTEMS FOR GAS TURBINE ENGINES

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JOSEPH LUCAS (GAS TURBINE EQUIPMENT) LTD., BIRMINGHAM & BURNLEY

Lucas-Rotax (Australia) Pty. Ltd., Nepean Highway, Cheltenham S 22, Victoria, Australia.
Lucas-Rotax Ltd., Scarborough, Ontario, Canada.

"Flight" photograph

B.E.A. Viscount "Sir Ernest Shackleton" approaches to land at London Airport. The successful introduction of the Viscount, paving the way for many orders from abroad, was the outstanding event of the Corporation's latest financial year —offsetting handsomely the deficit reported below.

CIVIL AVIATION

THE B.E.A. REPORT

A NET deficit of £1,773,797, compared with £1,459,131 last year, is announced in British European Airways' Report and Statement of Accounts for the year ended March 31st, 1954, published on Thursday last. For the first time, however, the Corporation earned an operating surplus (before amortization and depreciation charges) of £64,000, compared with a loss of £450,000 on the same basis for the previous year.

The traffic increase during the year under review was the largest since B.E.A.'s formation in 1946. The number of passengers carried was 1,656,779, some 257,000 more than in 1952-53. Load ton-miles performed increased by 23.1 per cent to 53,594,689, the average load factor increasing to 64.1 per cent.

The outstanding event of the year, the report states, was the introduction into regular airline service of the Vickers Viscount. In 15,400 hours' revenue flying during the year, mainly over the Corporation's longer routes, Viscounts have carried 146,454 passengers, earned some £3,150,000 revenue and made a net profit of £301,000.

The overall cost per ton-mile flown was reduced by 6.1 per cent from that of the previous year and, as mentioned, a higher load factor was achieved. The effect of these satisfying results was offset, however, by the steep fall in revenue rate due to the introduction of tourist fares. This revenue rate fell more sharply than the reduction in cost.

The major items of cost, which in total increased by 48 per cent (or nearly £1 million) during the year, were aircraft amortization, staff pensions, gross interest on capital, fuel tax and M.T.C.A. landing fees.

After mentioning the Corporation's new services introduced during 1953-54 (London-Palma, London-Lisbon, and London-Birmingham), the report goes on to discuss B.E.A.'s problems and prospects. Two things, it states, have become clear. These are the increasingly specialized nature of short-haul operations, aggravated by acute seasonal traffic problems, and the difficulty of securing adequate revenue from very short-haul routes.

"The fact is," the report continues, "B.E.A. makes clear profits on the combined results of all routes which have a sector distance longer than 260 miles and incurs losses on routes short of that distance—which are in the majority." The Corporation was endeavouring to reduce and ultimately eliminate the deficit, but (the report states), this could be achieved much sooner if H.M. Government substituted for the present deficiency grants a system of revenue payments towards specific uneconomic but essential services.

HERALDS FOR AUSTRALIA

AN unspecified number of Handley Page Heralds have been ordered by Queensland Airlines, who operate a network of local services in New South Wales and Queensland with a small fleet of DC-3s. No further details of the order have been disclosed.

Two prototypes of the Herald, a pressurized 36-44-seat airliner powered by four Leonides Majors, are being built, the first of which is due to fly next year. Deliveries for commercial service will begin in 1957.

The order is bound to create surprise in airline circles; it is unusual for even a large operator to order a new type of transport virtually off the drawing board unless it is assured of extremely solid financial support from its government or, more rarely, its shareholders. Queensland Airlines are a relatively small concern with a total traffic in the region of 40,000 passengers annually. The company is, however, owned by a larger airline, Butler Air Transport, which has already displayed considerable initiative by placing an order for Viscounts.

PRINCESS FREIGHTERS?

AMONG recent applications for the operation of scheduled air services addressed to the A.T.A.C., one of particular interest appeared in the advertisement columns of *Flight* for October 8th. The application was for "an all-freight service, initially with Solent flying boats and later possibly with a more modern type of aircraft, for the carriage of freight between Southampton (Marine) and Perth (Australia) with intermediate traffic stops at Ceylon, Singapore and Sourabaya, at a frequency of one service weekly increasing according to traffic demand for a period of ten years, commencing three months after date of approval."

The reference to a more modern type is stated by Aquila to refer to "more advanced waterborne aircraft"—presumably the Princess flying-boats, for which Mr. E. C. Mekie, the company's chairman, has bid more than £1m apiece. Last February the P. and O. group, claimed to be the largest shipping operators on Australian routes, bought a controlling interest in Aquila, who fly to Madeira, the Canary Islands and Capri with a fleet of Solents and Hythes.

This artist's impression of the projected Douglas DC-7C Seven Seas shows the taller tail and 10ft wider span which distinguish it from the DC-7. Additional fuel tanks, housed in the extended centre-section, are expected to increase the non-stop range to more than 5,000 miles.

"Flight" photograph

This Eagle Aviation Viking—G-AJPH "Lord Dundonald"—was a centre of attraction at Northolt recently, when it was "launched" by Mr. Peter Masefield. Externally, it differs from other Vikings in having a large rear door for freight-loading: it is also notable in that it was originally powered, for research purposes, by Nene turbojets.

CIVIL AVIATION . . .

MONARCH TO CAIRO

THE inauguration of B.O.A.C.'s Stratocruiser operation to Cairo with the Monarch service from New York via London and Frankfurt was particularly opportune, for the Egyptian Government has just given approval to a resumption of tourist activity, designed to re-attract British visitors.

Dr. Mohiel Din el Shazli Bey, Director-General of the Egyptian State Tourist Office, was host to the inaugural B.O.A.C. party, and his efforts, combined with those of the B.O.A.C. representatives in Egypt, have created what is described as " a profound impression" on Egyptians generally.

The Stratocruiser—*Cambria*—was the first ever to visit Cairo, and vast crowds welcomed it, despite the fact that it touched down in the small hours of the morning. W/C. Sadek Karmouty, director of the airport, whose recent work has resulted in the welcome streamlining of operations at Cairo, sent a telegram of greeting as the aircraft crossed the Egyptian coast, and was at the head of the reception party.

Demonstration flights were of quite a spectacular character. Members of the inaugural party sailed down the Nile in feluccas, the sails of which bore the announcement of the Monarch service in English and Arabic; meanwhile, *Cambria* flew around the fleet of craft. The Nile was in full flood but the operation was a great success and was seen by many of Cairo's inhabitants.

As the B.O.A.C. Monarch service is only to be flown weekly in each direction between New York and Cairo, it does not disturb the balance in Europe between B.E.A. and B.O.A.C. No local traffic, of course, is carried by the Monarch between London and Frankfurt. Total journey time by the through service from Cairo to New York is 30½ hours.

ACCOUNTANT AND FRIENDSHIP

WORK on the fuselage of the prototype Aviation Traders Accountant (two Rolls-Royce Darts) has been completed, and the remainder of the structure is taking shape at a satisfactory rate. Target date for the first flight is September 1955, and production aircraft should be available in 1956 at an estimated price of £87,500 apiece. For a range of 150 nautical miles the payload will be 10,600 lb, and the cost per ton n.m. 14.45 pence. Corresponding figures for a range of 600 miles are 8,720 lb and 10.92 pence, and for 1,000 miles 7,235 lb and 12.25 pence. The operating costs have been estimated for a height of 30,000ft, with pressurizing and air-conditioning.

With its two Rolls-Royce Dart RDa.6s, the Accountant will have a direct competitor in the Fokker Friendship, the latest news of which is that the front fuselage has been taken out of the assembly jig. A large water basin is being constructed for pressure tests.

BOEING 707 EVALUATION

THE "first phase" evaluation testing of the Boeing 707 transport was completed at Seattle a few days ago, well ahead of schedule. Of the 50 hours' flying time for which the makers had budgeted only 43 hr 27 min were required. The final 26 hr 37 min flying was completed in only nine days. Scheduled tests included maximum level flight speeds at all heights, and further detailed performance investigations. Control forces were reported "excellent" in all configurations.

The next phase of testing will involve such items as systems, aerodynamics and power plants, and will be particularly concerned with production of the U.S.A.F. tanker-transport version.

Precise performance figures are not being divulged, but on September 28th the prototype flew from Seattle to Portland, Oregon, in 13 min, at a ground speed of just over 636 m.p.h. On September 24th the aircraft made a flight of 5 hr 5 min duration.

B.E.A.-WESTLAND CONTRACT

A CONTRACT for two Westland-built S-55 helicopters plus spares was signed in London on October 6th by B.E.A.'s chairman, Lord Douglas of Kirtleside, and the chairman of Westland Aircraft Ltd., Mr. Eric Mensforth. The first of the new helicopters, which cost £54,000 each less spares, will be delivered to B.E.A. next month and the second by the end of this year. They will be used to operate a scheduled service between the South Bank and London Airport at a frequency of up to eight round trips daily. For the flight, which will take 17 minutes compared with one hour by coach, it is proposed to charge a single fare of 30s.

Between the South Bank site at Waterloo and the end of the defined built-up area, the helicopters will follow the line of the Thames, and they will be fitted with floats to enable them, in an emergency, to touch down on the water. Use of flotation gear will, however, reduce the payload to five passengers and their baggage (Sabena's inter-city S-55s can carry seven passengers).

The signing of the contract gave Lord Douglas an opportunity to express the Corporation's current philosophy on the subject of helicopters. Attaining the stage of scheduled inter-city services with twin-engined helicopters capable of carrying 40-45 people at 150 m.p.h., he said, would be a slow and painful business. There was a good deal of optimism among people whose imaginations were fired by this idea; he felt there was a danger of over-optimism. The first twin-engined civil helicopter was not likely to come into service before 1958 and it would probably be an American helicopter. British designers, said Lord Douglas, were a little bit behind at the moment.

B.E.A. did not want to spend dollars buying American helicopters if British machines were available, but their hand might be forced by competition from Sabena, who planned to inaugurate a Brussels-London service [with Sikorsky S-56s] by 1958. The S-56, said B.E.A.'s chairman, looked to be the first of the next generation of helicopters. The answer to the dollar problem might be a hybrid helicopter employing the basic American design with British turbines and other refinements.

Mr. Mensforth confirmed that his company was interested in "the basic engineering" of the S-56 and he thought that the British lead in gas turbines could successfully be applied to helicopters. He added a slightly cryptic reference to the possibility of an intermediate between the S-55 and the S-56. Bearing in mind Westland's co-operation with Sikorsky, this might be taken to mean a Westland development of the S-58 single-engined military helicopter, which in civil form will carry up to 20 passengers. The S-56 is a twin-engined single-rotor helicopter comparable in size to the DC-3. Its makers claim that a 35-seat civil version will be available in two or three years.

Despite the potentialities of the S-56, Lord Douglas implied that even this machine will not fully meet B.E.A.'s requirements for an inter-city helicopter when he said: "I cannot see the dream of a big network of large helicopters operating between the cities of Britain and the Continent coming to fruition before about ten years from now."

Lord Douglas of Kirtleside (right) and Mr. Eric Mensforth after the signing of the S-55 contract reported above. The object of their admiration is a model S-55 in B.E.A. colours.

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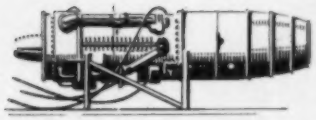

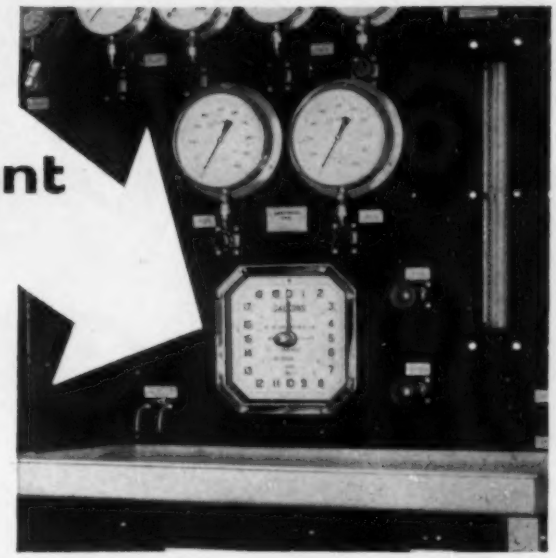

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The Britannia 100 prototype, G-ALBO, at Idris, where tropical trials have just been completed. The aircraft flew there direct on September 25th, and was due to return to Filton on Wednesday.

CIVIL AVIATION...

DC-7Bs FOR SOUTH AFRICAN AIRWAYS

IT is now officially confirmed that three DC-7Bs, costing a total of $8,400,000 (£3m), have been ordered by South African Airways for service between Johannesburg and the principal European cities. Delivery is scheduled for April 1956, and the order raises the total of DC-7s already sold by Douglas to 108. Simultaneously with the above news came the announcement that Alitalia had ordered another DC-6B.

BREVITIES

THE 35th aniversary of K.L.M. was celebrated on October 7th. Since its inception the line has carried 5,300,000 passengers, nearly 220,000 tons of freight, mail and baggage, and has flown 250 million miles. The occasion was marked by an unveiling of a memorial plaque to Dr. Plesman in 86 K.L.M. offices, and by the presentation of medals to K.L.M. "mileage millionaires."

* * *

Avianca, the national airline of Columbia, last week introduced Super Constellations on their services between Bogota and Europe. The new aircraft are equipped to carry 39 first-class and 15 tourist passengers. European calling points for the service are Lisbon, Madrid, Paris and Frankfurt.

For some months the Manchester Corporation and the Royal Automobile Club have been co-operating on a scheme for signposting a number of recommended routes to Manchester Airport, and as part of the scheme the Municipal Information Bureau has produced a leaflet, incorporating a simple map showing the newly signposted routes and suggested routes for drivers coming from other cities. On completion of the signposting programme in the near future the leaflets will be available free to road users.

* * *

Staffed by K.L.M. personnel and operated under charter to the Dutch government, a new airline is due to begin work in Dutch New Guinea on November 1st. The company is based at Biak and is to be known as N.G.L.M. (Nieuw Guinea Luchtvaart Maatschappij). In charge of operations is Captain Carl Mattern, the chief pilot. Equipment consists of two float-equipped D.H. Canada Beavers, the upper surfaces of which have been painted bright orange for bush identification purposes.

* * *

It was announced last week by the West German radio network that Lufthansa hoped to be ready to start operations by next Spring. Federal Government officials were confident that the occupation statutes which prevent Germans from flying powered aircraft would shortly be removed. Britain and the United States are said to have approved the West German Government's application for special licences to operate European services with Convoir 240s, but French approval has yet to be obtained.

PLANNING FOR THE BRITANNIA (Continued from page 573)

well served by aids, much of the in-flight navigation is now done by the pilots. For use over sectors inadequately served by radio-navigational aids, the Britannia pilots will have a drift sight of the new Kelvin Hughes pattern. With the latter, the precise drift and ground speed can be determined even over featureless country, and this makes it easy to stay on track. And in order to be dead on time, D.M.E. is carried; this is regarded both as a navigational aid and as an operational instrument, in that it is principally used to fix the point of let-down. A periscopic sextant is also carried in the roof, and is regarded as a valuable stand-by on most stages and as a major aid on others—such as Colombo/Singapore, where there is a long stretch devoid of ground assistance.

There is a considerable body of opinion which thinks that conventional navigation lights, flashing or otherwise, are not sufficient to avoid possible collisions in bad weather or at night when in the vicinity of busy airports where traffic control is less precise than it is at London. A really powerful beacon light would certainly appear to be amply worthwhile. Another problem is that certain overseas airfields are notorious for having obstructions left on taxiways; the Britannia, with its large airscrews positioned far out along the wing, will require very adequate forward lighting for night taxying. A hand-held Aldis can be used to sweep the road ahead.

All considerations of radio and instrumentation are, of course, subject to the routes flown, international agreements and other political factors, and hard-and-fast decisions cannot yet be taken in respect of the Britannia. The later Series 300 will fly right into the United States, and will probably have to be equipped with the dual V.O.R. system which is now being standardized on American routes. The Series 100, however, should require no more than a single V.O.R. installation, used in conjunction with D.M.E. and other aids. Instrumentation will be better than in any previous transport, and will incorporate many of the new systems exhibited at the 1953 and 1954 S.B.A.C. shows. The auto-pilot is the Smiths S.E.P.2.

From the outset, the Britannia has been potentially the greatest money-maker yet designed, and there is every indication that it will fully live up to its early promise. It flies like any other transport, and it looks conventional, and yet its characteristics place it in a class of its own—with high cruising speed, efficient engines burning cheap fuel, enormous capacity, unexcelled comfort, and great flexibility in service. Last Friday, Capt. Houston himself spent 6½ hr flying the first production machine, and he commented afterwards that this extended flight, involving far more work than would a simple scheduled stage of this duration, was if anything less tiring than a similar time spent in his office. If the Britannia is as popular with passengers as it is becoming with its crews, Bristols—and B.O.A.C.—have a real winner.

Supplies are unloaded from G-ALBO on arrival at Tripoli. Total capacity of the Britannia 100's two under-floor freight holds is 665 cu ft.

The handsome terminal at Dar-es-Salaam, which is served by four regular operators — East African Airways, Central African Airways, B.O.A.C. and Sabena. Of these, E.A.A. are the most regular visitors, averaging 330 take-offs or landings and 4,600 passenger movements monthly.

New Airport for Dar-es-Salaam

TOMORROW, October 16th, a Percival Prince of the Tanganyika Government is due to make the first official landing at the new airport for Dar-es-Salaam, Tanganyika's capital. Aboard the aircraft will be the Governor, Sir Edward Twining, accompanied by Mr. A. T. Lennox-Boyd, the Secretary of State for the Colonies and former Minister of Transport and Civil Aviation. Their arrival will constitute the opening of the airport, which replaces the Kilwa Road airfield used as the Dar-es-Salaam terminal for the past 26 years. After his arrival Mr. Lennox-Boyd will unveil a commemorative plaque on the front of the terminal building.

The new airport covers 1,000 acres of typical African bush, and its construction has entailed the moving of nearly 1¼m cu yd of soil. Preparatory work included the filling-in of three valleys on the site of the main runway and the excavation of more than 200 ant-hills (some of up to 60ft diameter).

The main runway, 6,800ft long with a 1,200ft stopway at each end, is intended to carry all types of aircraft likely to pass through East Africa, including the Britannia, Comet and Super Constellation. Both the main and the secondary runway, which is 4,500ft long, are set in graded grass strips respectively 1,000ft and 700ft wide. The runways are constructed of crushed-stone pavements of not less than 10in thickness with a surface layer of asphalt and bitumen.

Considerable precautions have been taken against flooding and erosion. Drainage has involved the laying of three miles of concrete-lined storm-water ditches, seven miles of piped drains alongside and beneath the runways, and outfall channels in the valleys below the airport. In order to prevent erosion and dust nuisance, eight million sprigs of grass have been planted in the 200 acres of strip bordering the runways and taxiways.

The apron will accommodate six to seven large aircraft, and a special concrete standing area is provided for jet airliners. Modest in size, the terminal facilities are of pleasing appearance and have been designed with a view to extension when required.

Radio facilities have been engineered and installed by International Aeradio, Ltd. (East Africa) which, under contract to the East Africa High Commission, is responsible for the installation and maintenance of such facilities at 28 airfields throughout East Africa. The airport was built under the supervision of the Director of Public Works, Tanganyika. The consulting engineers were Sir Alexander Gibb and Partners, while the Tanganyika Engineering and Contracting Co. were responsible for the preparation of the site, the runways and the taxiways.

(Above) A bulldozer is seen flattening a small hill during the construction of the airport. On the left is a view of the 6,800ft main runway (045/255), with the terminal area visible at the top right-hand corner of the picture.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News

Demonstration for Emperor

WHEN the Emperor of Ethiopia took passage in the cruiser H.M.S. *Gambia* from Malta for his official visit to Britain, naval and air demonstrations were given for his benefit. As *Gambia* left Grand Harbour, there was a fly-past by Vampires of No. 78 Wing, R.A.A.F., Sea Hawks of Nos. 803 and 806 Squadrons, F.A.A., and Whirlwinds of No. 845 Squadron, F.A.A. Later the Emperor watched jet-aircraft deck landings on H.M.S. *Centaur*.

On *Gambia's* arrival at Portsmouth yesterday a fly-past by three flights of R.A.F. Shackletons, commanded by S/L. C. B. Brown, was due to take place.

Carrier Movements

FOLLOWING the decision to make certain reductions in U.N. forces in Korea, H.M.S. *Centaur*, at present working up in the Mediterranean, will now remain with the Mediterranean Fleet until late June, 1955, and then return to the United Kingdom to dock at Portsmouth and be available for NATO Fleet exercises in Home waters in September next. Originally it was intended that *Centaur* should relieve H.M.S. *Warrior*, which ship is now in the Far East and is expected to return to the United Kingdom *via* the Cape of Good Hope in December.

More Helicopters for R.C.A.F.

THE purchase of ten Sikorsky S-55 helicopters has been announced by the Royal Canadian Air Force headquarters. Delivery has already begun; six arrived at the end of September and two more are due in each of the months October and November. The R.C.A.F. is already operating Sikorsky S-51s and recently started to take delivery of Piasecki H-21As.

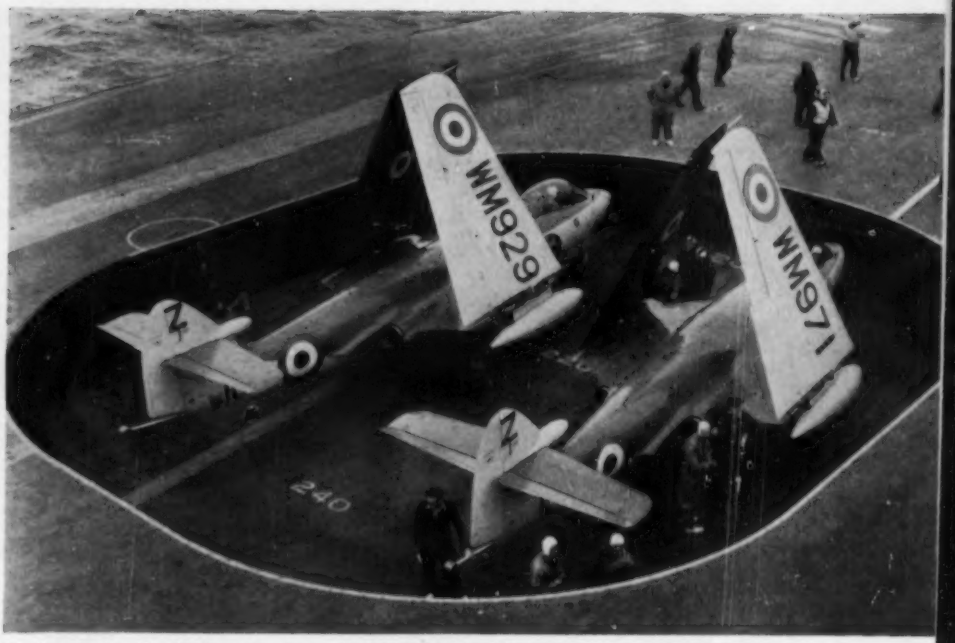
It is intended to use the S-55s, like the H-21As, for search and rescue operations. Twenty-four pilots are to be trained to fly them and eight are already at the Okanagan Helicopter Co., in British Columbia, for instruction.

Middle East Moves

THE Air Ministry has announced that A.V-M. H. H. Brookes, C.B., C.B.E., D.F.C., has taken up the appointment of A.O.C. Iraq, and that A.V-M. P. S. Blockey, C.B.E., will become S.T.S.O. at Middle East Headquarters from next month.

A.V-M. Brookes has been A.O.C. No. 25 Group, Flying Training Command, since last February and previously was A.O.C. Rhodesia Air Training Group.

A.V-M. Blockey has, for the past ten months, been Director of Technical Plans at the Air Ministry and before that was S.T.S.O. at Transport Command headquarters.



Two Sea Hawks of No. 898 Squadron descend into H.M.S. "Albion's" hangar on the carrier's forward lift. Skyraiders of 849 Squadron and Wyverns of 813 are the other occupants who share "Albion's" hangar space. The Skyraiders serve for early warning, and the Wyverns for strike.

R.N.R. Air Branch

PRIMARILY intended for ex-Service pilots who are now professional pilots employed by civilian concerns engaged on Admiralty contracts, it has been decided to form a new section of the R.N.R. to be known as the Royal Naval Reserve Air Branch. Conditions of service are similar to those of the R.N.R. and the new branch will be administered by the Admiral Commanding Reserves, to whom applications should be made.

It is thought, in general, that members of the R.N.R. Air Branch, being professional pilots, will require no flying training. They will, however, be appointed to ships and establishments where they will have opportunities of keeping up to date with Naval developments.

Naval Appointments

AMONG other appointments announced by the Admiralty are those of Capt. D. R. F. Cambell, D.S.C., R.N., to *Daedalus*, for duty with Flag-Officer Air (Home), Capt. E. C. Beard to the Aircraft Maintenance and Repair Department, Admiralty, and Capt. A. E. Turner as Superintendent, R.N. Aircraft Repair Yard, Fleetlands.

New Canadian Air Defence Command C.S.O.

CANADIAN Air Force headquarters announce that A. Cdre. K. L. B. Hodson, O.B.E., D.F.C., C.D., has been appointed Chief Staff Officer at Air Defence Command headquarters, St. Hubert, P.Q. His post as C.S.O. of the R.C.A.F. Air Division in Europe has been filled by A. Cdre. W. I. Clements, O.B.E., C.D.

A. Cdre. Hodson came to Britain in 1941 and flew with No. 602 Squadron. In 1942 he commanded No. 401 Squadron, R.C.A.F., and a year later took over command of No. 126 Canadian Wing. In the campaign through western Europe he served as a liaison officer with the United States 9th Air Force.

R.A.F. Appointments

THE following appointments in the rank of wing commander are announced by the Air Ministry: J. W. Allan, D.S.O., D.F.C., A.F.C., to Weston Zoyland; B. C. Bennett, A.F.C., to Oldenburg; E. F. Pippett to H.Q. Fighter Command; all for administrative staff duties. In command, C. A. R. Crews goes to Hornchurch.

For air staff duties R. E. G. Van Der Kiste, D.S.O., is at H.Q. Coastal Command; H. C. Daish, O.B.E., to H.Q. No. 66 Group; and G. E. Burtenshaw to H.Q. No. 40 Group. E. C. Ashley goes to H.Q. M.E.A.F. technical staff.

W. D. Woods is at the Ministry of Supply and C. A. Denne in the department of the Air Member for Supply and

The first of the ten Sikorsky S-55s purchased by the Royal Canadian Air Force landing at R.C.A.F. Station Sea Island, British Columbia. (See "More Helicopters for R.C.A.F." above.)

SERVICE AVIATION...

Organization. For staff duties K. Gray is at SHAPE; J. B. Grant, D.S.O., D.F.C., at AAFSE; and E. A. Bradley and P. A. L. Cooper at AAFCE.

Appointment

AFTER spending over two years as A.O.C. No. 206 Group, Middle East Air Force, A. Cdre. M. S. Shapcott is to become Director of Equipment (B) at the Air Ministry from December next.

At the outbreak of war in 1939, A. Cdre Shapcott was on the staff of the Directorate General of Equipment but later served on the planning staffs of Supreme Headquarters Allied Expeditionary Force, Air H.Q. Burma, Base Air Force H.Q. South East Asia and Air H.Q. India.

No. 88 Squadron Disbanded

THE first R.A.F. unit to fly operational sorties in the Korean War in 1950, No. 88 Squadron, has been disbanded at Seletar, Singapore. The reviewing officer at the disbandment ceremony was Air Marshal Sir Clifford Sanderson, K.B.E., C.B., D.F.C., C-in-C. Far East Air Force. S/L. H. T. Francis, D.F.C., was in command.

This is the third time No. 88 has been disbanded and on each of its "lives" the unit has performed different rôles. The first unit saw service in France in April 1918, ten months after it had been formed, and was then equipped with Bristol Fighters for artillery observation and reconnaissance duties. In the few months that elapsed between arrival on the Continent and the Armistice in November 1918 claims were made for 164 enemy aircraft destroyed.

The first disbandment came in 1919 and the squadron was dormant until 1937, when it was re-formed, going to France again at the outbreak of war equipped with Fairey Battles. It claimed the shooting down of the first enemy aircraft, an Me 109.

With the fall of France No. 88 returned to England and was re-equipped with Bostons, taking part in shipping strikes and bombing operations, including the Dieppe raid in 1942 and attacking flying-bomb sites in 1943-44. Its main duty on D-day was the laying of a smoke screen to cover some of the assault troops. Later, operating under 2nd T.A.F. the unit again moved across the Channel and was disbanded shortly before the end of the war.

Its third re-formation, which took place in September 1946, saw No. 88 flying Short Sunderlands in the Far East, operating a regular service between Japan and Hong Kong. In two years 480,000 miles were flown, 2,000 passengers carried and 385,000 lb of freight and mail transported. It was in a Sunderland of No. 88 Squadron, in April 1949, that an R.A.F. doctor with medical supplies flew to the aid of H.M.S. *Amethyst* in the Yangtse River.

On the outbreak of the Korean War in 1950 the unit started flying reconnaissance patrols. During that war 467 sorties were made and a further 165 sorties in connection with the Malayan campaign.

Air Commandant N. M. Salmon greets Capt. Weitzel on arrival in Britain. *(See "Swiss Visitor" on this page.)*

A delicate operation: the lowering of part of an iron-lung apparatus from a Naval Dragonfly on to the deck of U.S.N.S. "General Maurice Rose" to relieve a case of poliomyelitis. The helicopter was flown by Lt. Cdr. G. C. J. Knight, R.N., in a gale and with cloud down to 300ft.

Swiss Visitor

DURING the past week Capt. Andrée Weitzel, chief of the Swiss Auxiliary Women's Services, has been visiting R.A.F. units in the United Kingdom. Her itinerary included the W.R.A.F. depot at Hawkinge, R.A.F. stations at Hullavington and Compton Bassett, the W.R.A.F. Training Wing at Wilmslow and No. 3604 Fighter Control Unit in London.

Biggin Hill History

FOLLOWING an appeal last year for information and illustrations concerning the history of Biggin Hill, a great deal of valuable material has been submitted. It is hoped that the history will be completed during next year and anyone who has any further contributions is asked to send them to the station commander as soon as possible.

In the meantime a short history has been compiled in the form of an illustrated brochure, copies of which may be obtained from the station by post, price 1s each. All profits go to the Royal Air Force Benevolent Fund.

R.A.F. Promotions

THE following promotions from flight lieutenant to squadron leader in the General Duties Branch are announced. They are with effect from October 1st.:—

A. E. Henderson, A.F.C.; E. W. Talbot, D.F.C.; G. S. Chalmers; W. H. Bengree; R. K. Bailey; G. D. Sutcliffe; P. Killick; L. A. T. Best; D. W. McAdam, D.F.C.; J. A. Costello, D.F.C., D.F.M.; H. Ambrose, D.F.C.; G. T. Donaldson; K. L. Hughes; J. Jones; D. S. Lister; W. I. Harris, A.F.C.; W. M. Kelly; T. E. Johnson, D.F.C.; T. L. Hunt; J. B. Phillips; L. Moore; J. E. Petty; T. McN. Ormiston, D.F.C.; J. I. Parker; P. C. Bowry; B. H. Walker; D. McK. Blackmore, D.F.C.; D. L. Attlee; A. Collins, A.F.C., D.F.M.; S. F. Oliver, M.B.E.; F. W. Cox, D.F.C.; J. Murphy, A.F.C.; N. O. S. Bayley, D.F.C.; J. C. Woods; H. S. Horth, A.F.C.; N. Marriott, D.F.C.; W. E. Colahan, D.F.C.; L. S. Laughton; F. M. Hegarty, A.F.C.; C. C. Povey, D.F.C.; J. H. Walton; J. S. W. Bell; R. S. Pritchard; M. Downes; D. G. Evans; E. Trees; S. L. Tunstall and D. J. Fowler, A.F.C.

F. E. Dymond; R. A. Patterson; R. G. Milton, A.F.C.; L. T. Mersham; G. S. Taylor; F. R. Davidson, D.F.C.; W. G. Drinkell, D.F.C., A.F.C.; W. Massey; J. N. Yates, D.F.C.; A. Maitland, D.F.C.; D. R. George; C. J. Bleakley; L. J. Scott; D. G. G. Baird; D. R. Ware, D.F.C., A.F.C.; S. P. Johnson, D.F.C., B.E.M.; E. W. F. Hare; J. F. C. Melrose, D.F.C.; I. L. McCombie; P. H. P. Roberts; H. G. Cousins; E. R. W. Lawson; H. R. Farmery; W. L. Donley, D.F.C., D.F.M.; T. C. Woods; D. F. M. Browne; K. Barnes; E. W. Cropper; G. W. Massey; H. G. James, A.F.C., D.F.M.; C. J. Homes, A.F.C.; C. A. Sullings, A.F.C.; F. P. Walker; L. J. Cook; A. W. Tarry; R. J. Hawtin; R. Coates, D.F.C., A.F.C.; S. J. Deards; J. A. Crispin; R. K. Brown; R. L. Easterbrook; G. Clubley, D.F.C.; A. H. E. Welch, D.F.C.; R. D. A. Smith, D.F.C.; G. F. Clark; D. G. Walker, A.F.C.; D. W. Sutton, D.F.C.; and D. Gray, A.F.C.

Reunions

ON October 23rd a reunion of No. 225 Squadron is being held in the New Norfolk Hotel, London Street, Paddington, London, W.2, at 1830 hr. Tickets (7s 6d) from J. O. Lupton, 16, Rosedale Road, Heaton Chapel, Stockport, Cheshire.

A reunion for all members who served with No. 69 Squadron between May 1944 and May 1945 is being held on October 23rd at the Coronet Bar, 10 Soho Street, London, W.1. Further details from J. Swift, 17 Atkinson Street, London, S.E.14.

Pilots of No. 63 Squadron are holding a reunion dinner in the Connaught Rooms, Great Queen Street, London, W.C.2, on Friday, October 29th. Tickets (30s) from the Adjutant at R.A.F. Waterbeach, Cambs.

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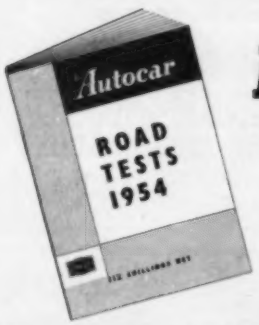

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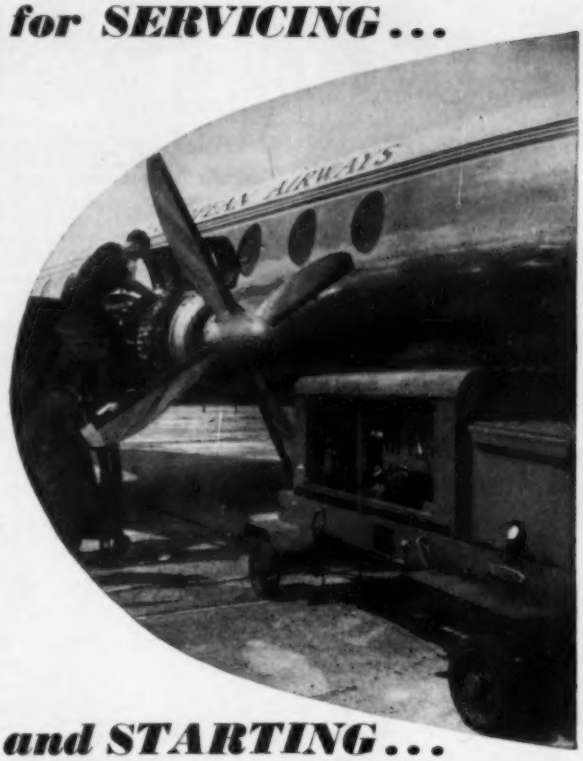

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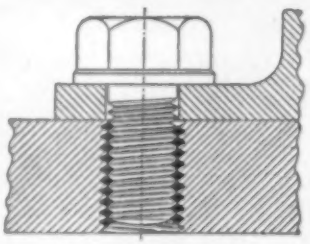

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THE Air Transport Advisory Council give notice that they have received the undermentioned applications to operate scheduled air services:—

FROM Silver City Airways, Ltd., of 1 Great Cumberland Place, London, W.1:

APPLICATION No. 387 for a seasonal vehicle ferry service, with Bristol 170 aircraft, for the carriage of vehicles and associated passengers only between Ferryfield and Basle at a frequency of from two services weekly to two services daily during the season from mid-December to the end of the Easter Holiday period each year, for seven years, from December 18th, 1954.

APPLICATION No. 388 for a seasonal vehicle ferry service with Bristol 170 aircraft, for the carriage of vehicles, passengers and supplementary freight between Southampton and/or Ferryfield and Le Havre and/or Deauville, at a frequency of up to 12 services daily during the season from April to October inclusive, each year, for a period of 10 years, commencing April 1st, 1955.

APPLICATION No. 389, from Britavia, Ltd., of 1 Great Cumberland Place, London, W.1, for an all-freight service with Hermes aircraft for the carriage of freight between London and Perth (Australia), with intermediate traffic stops at Naples, Nicosia, Bahrein, Karachi, Colombo, Singapore and Sourabaya, or alternatively at Lyon, Marseilles, Geneva, Athens, Istanbul, Malta, Beirut, Damascus, Alexandria, Lydda, Basra, Bombay and Djakarta at a frequency of up to three services weekly for a period of 10 years, commencing within three months from the date of approval. This application is supplementary to Application No. 371 from Aquila Airways, Ltd.

APPLICATION No. 390 from Airlines (Jersey), Ltd., of 4 The Parade, St. Helier, Jersey, C.I., for a normal scheduled service with D.H. Heron and D.H.89 aircraft for the carriage of passengers, supplementary freight and mail between Jersey/Guernsey/Alderney and Cherbourg at a frequency of from one service weekly, increasing to frequent daily services, for a period of eight and a half years, commencing from date of approval.

APPLICATION No. 340 (amended), from Air Kruise (Kent), Ltd., of Lympne Airport, Kent, for a seasonal inclusive tour service with Dakota aircraft, to be operated in conjunction with Blue Cars (Continental Coach Cruises), Ltd., for the carriage of passengers between Lympne/Ferryfield and Turin, at a frequency of two services weekly during the season from April to October inclusive each year, for a period of seven years, commencing April 1st, 1955.

APPLICATION No. 391 from British Overseas Airways Corporation, of Airways House, Great West Road, Brentford, Middlesex, for amendments to the normal scheduled services which they operate on the routes set out as Routes Nos. 1, 4 and 5 in Schedule "A," Part 1, of the terms of reference issued to the Council by the Minister of Civil Aviation on July 30th, 1952, to permit, in addition to the traffic stops already authorised, additional traffic stops at Butterworth and/or Kuala Lumper for a period of 10 years from the end of October, 1954.

APPLICATION No. 339 (amended) from British Overseas Airways Corporation, of Airways House, Great West Road, Brentford, Middlesex, for a normal scheduled service with Argonaut or Constellation 749 aircraft for the carriage of passengers, supplementary freight and mail between London and Abadan or Abadan and Karachi, with intermediate traffic stops at Zurich, Rome, Nicosia or Beirut or Cairo, at a frequency of one service weekly, increasing according to traffic demand, during a 10-year period.

APPLICATION No. 31/3 from Airwork, Ltd., of 15 Chesterfield Street, London, W.1, for the inclusion of optional traffic stops at Manchester and at Shannon on their all-freight services between London and Montreal and London and New York (Applications Nos. 31 and 32), approved by the Minister of Transport and Civil Aviation for operation during the period up to May 31st, 1963.

THESE applications will be considered by the Council under the terms of reference issued to them by the Minister of Civil Aviation on July 30th, 1952. Any representations or objections with regard to these applications must be made in writing, stating the reasons, and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 3 Dean's Yard, Westminster, London, S.W.1, from whom further details of the applications may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, should reach them within the period allowed for the making of representations or objections. [2729

MARSHALLS' AIRPORT WORKS
CAMBRIDGE

Have vacancies for following Skilled Personnel on Modern Service and Civilian Aircraft at Cambridge and also "on site."

Aircraft Inspectors with knowledge of A.R.B. and/or A.I.D. procedure.

Engine Fitters with experience of jet and/or turboprop engines.

Airframe Fitters.

Aircraft Electricians.

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Pleasant hostel accommodation available. Generous subsistence allowances whilst "on site."

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For an extremely wide range of interesting high priority, experimental and development work.

Salary range — up to £1000 per annum.

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White Waltham Aerodrome, Maidenhead, Berks.

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Owing to internal staff promotions, applications are invited for the post of CHIEF ENGINEER to be responsible for the maintenance of Mosquito and Vampire Aircraft at LANGHAM AERODROME, Norfolk.

The aircraft are serviced and operated by civilian personnel under Air Ministry Contract. No licences are required, but applicants should have long experience with service type aircraft, including an intimate knowledge of technical administrative work and procedures, applicable to the operation of service aircraft.

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Applications, with full details, to:

Personnel Manager, Marshalls Flying School Ltd., Airport Works, Cambridge.

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FOR SALE: Aviation Maps, half million and a few four miles to the inch maps covering most of Europe. Send for list. Survey Flying Club, Croydon Airport. [0294

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STEEL framework of large building, hangar or warehouse for sale, 120 ft. wide. Suitable export. First-class condition. Price one half of present replacement value.—Bellmans, Terminal House, S.W.1. [2603

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AIRCRAFT cameras K20, K24, F24, F52, etc. We have large stocks equipment, including controls, mounts, lenses and processing tanks, film.
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AMERICAN and British aircraft cameras: large stocks of latest models available, including F.24, F52, K8a, K20, K24 and G.45, etc. Also spare parts, lenses, films, equipment, etc. Inquiries will receive immediate attention.
DIRECT PHOTOGRAPHIC SUPPLY CO., 2, Harrow Road (Cnr.) Edgware Road, London W.2. Tel.: PADdington 7581. [0563.

SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through the local office of the Ministry of Labour and National Service, etc., if the applicant is a man aged 18-64 or a woman aged 18-59 inclusive, unless he or she or the employer is excepted from the provisions of The Notification of Vacancies Order 1952.

GUIDED WEAPONS

A MAJOR guided weapons contractor has three vacancies in the structures and aerodynamics departments.
ONE stressman is required of Degree or H.N.C. standard, with previous experience of aircraft stressing and structural design desirable. Candidates who have completed an engineering apprenticeship will be given preference.
DUTIES include structural design and test work planning of missile airframes, together with development of new methods of fabrication.
TWO aerodynamicists are required who have an honours degree in aeronautics or mathematics. Experience of supersonic aerodynamics is desirable.
DUTIES include aerodynamic design of missile airframes, performance and control investigations, theoretical aerodynamic studies and planning of wind tunnel and flight tests.
APPLICANTS should have no National Service commitments.
SALARIES and prospects of promotion on merit are excellent. Good working conditions, pensions scheme and welfare facilities.
APPLICATIONS, quoting D.O.24, giving details of age, experience, qualifications and salary required, should be addressed to the Personnel Manager, Aircraft Division, Bristol Aeroplane Company Limited, Filton House, Bristol. [2723

CHIEF PROJECT DESIGN ENGINEER

WELL-ESTABLISHED aircraft design and manufacturing firm with wide interests have a vacancy for an experienced man, capable of controlling highly qualified technical staff, and to be responsible for initial project work.
THIS is a senior position with a good salary and prospects. Good staff insurance and pension scheme.
APPLICATIONS are invited, and will be dealt with in strict confidence. All applications will be acknowledged.
WRITE, stating age, full particulars of qualifications, experience, and salary required, to Chief Designer, Box 7913. [2623

AIRCRAFT draughtsmen and stressmen required.—Apply, stating age, experience and salary required, to Aviation and Engineering Projects, Ltd., Alexandra Road, Hounslow. HOUnslow 9621. [2685

A. J. W. (INSTRUMENTS), Ltd., Vacancies for experienced instrument mechanics. Interesting and varied work on automatic pilots, gyro, electric and physical instruments.—Apply to A.J.W. (Instruments), Ltd., Gatwick Airport, Horley, Surrey. [0270

AUSTER AIRCRAFT LTD.

WE ARE NOW RE-ORGANISING and EXPANDING our

Design Department and can offer interesting work on completely
NEW DESIGNS
with opportunities for
RAPID ADVANCEMENT

We require:
DESIGN GROUP LEADER
(wing group)
and
DESIGN GROUP LEADER
(fuselage group)
to take charge of detail design work on those components.

DEPUTY CHIEF STRESSMAN
with experience in a similar position.

PLASTICS DEVELOPMENT ENGINEER
with experience of the practical application of reinforced plastics.

We also require:
Project Draughtsmen
Project Stressmen
(Preferably with H.N.C. and five years' experience.)

Senior Design Draughtsmen
Senior Stressmen
(Preferably with H.N.C. and five years' experience.)
Senior Mods Draughtsmen

Aerodynamicists
Test Rig Designers
Intermediate Draughtsmen
Technical Illustrators
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Assistance with housing for senior personnel.

Cheap flying with Firm's Flying Club.

Attractive Staff Pension Scheme.

Applications (in confidence) should be addressed to:

THE CHIEF DESIGNER
REARSBY LEICESTER

SITUATIONS VACANT

ROTOL/BRITISH MESSIER LIMITED, GLOUCESTER

APPLICATIONS are invited for the following vacancies:
1. Technical assistants for initial design work on the following projects:
   (a) Turbo propellers
   (b) Air and gas turbines for aircraft auxiliary power supply
   (c) Controllable pitch marine propellers
   (d) Fractional and medium horse power electric motors, synchronising and control devices and instrumentation.
2. Development engineer for the electrical and general instrumentation aspects of the development programme on guided weapons.
3. Senior test engineers, preferably with servo experience for work on guided weapons.
4. Senior stressmen.
5. Junior stressmen.
6. Electrical design engineer for new electrical design work and control of detail design.

FOR these vacancies, applicants should preferably be university graduates, but applications from suitable candidates holding H.N.C. will be considered. Previous experience in one or more of the above fields is desirable, but not essential.
7. Technical assistant for gearbox development. The work entails the preparation of test schedules, development work on aero engine auxiliary gearboxes and the preparation of reports on tests.
8. Junior test engineer for work on the development of miscellaneous hydraulic components for aircraft.
9. Junior test engineer for work on the development of aircraft landing gear.
10. Laboratory assistant for general electronic wiring and test duties on guided weapon programme.
11. Laboratory assistant for general rig wiring and test duties on electro hydraulic components.
12. Laboratory assistant, Inter. B.Sc. standard for metallurgical analysis.
13. Senior, intermediate and junior draughtsmen for design work on aircraft components.
14. Senior jig and tool draughtsmen.
15. Process planning engineers.

MINIMUM qualifications for vacancies 7-15, O.N.C. in the appropriate subjects. Previous experience in the aircraft industry desirable.
16. Modification draughtsmen, D.I.S. clerks and technical clerks.

THE above appointments offer interesting and progressive positions to men of suitable qualifications and experience. The factory is pleasantly situated between Gloucester and Cheltenham and working conditions are good. Superannuation and welfare schemes are in operation.
APPLICATIONS, giving details of age, education, training and experience, and salary required, specifying the vacancy for which application is made, should be addressed to the Personnel Manager, Messrs. Rotol/British Messier Limited, Cheltenham Road, Gloucester. [2673

AERODYNAMICIST

A RAPIDLY expanding precision instrument manufacturing firm holding long term design and development contracts has a vacancy in its aerodynamics department for very interesting work on auto-pilots. Good salary and excellent prospects for a man of degree standard or equivalent. Previous experience not essential.
PLEASE forward full details of career and salary required (which will be treated in strict confidence) to Box 7796. [2728

CHIEF INSPECTOR

FULLY qualified chief inspector required for rapidly expanding Midlands company engaged in the manufacture of sheet metal details and assemblies. Applicants should be fully conversant with all Ministry procedures and the latest manufacturing developments including all types of welding. This position carries an excellent salary and offers unlimited opportunity for a person with organising ability. Apply in first instance by letter, giving full particulars of past experience and present position held to Ref. "EL," Box 8266. [2712

WIRELESS station superintendents required by the NIGERIA Posts and Telegraphs Department for one tour of 18 to 24 months in the first instance. Option of appointment (a) on temporary terms with salary scale (including expatriation pay) £864, rising to £1,392 a year. Gratuity at the rate of £100/£150 a year, or (b) with prospect of pensionable employment with salary scale (including expatriation pay) £750, rising to £1,175 a year. Outfit allowance £60. Free passages for officer and wife. Assistance towards cost of children's passages or grant up to £150 annually for maintenance in U.K. Liberal leave on full salary. Candidates must have had wide practical experience of modern radio techniques and equipment, in particular V.H.F. equipment, and preferably also V.H.F. multi-channel equipment.—Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience, and quote M2C/30086/FE. [2730

EXPERIENCED radio officer required: apply B.K.S. Air Transport, Ltd., 13a Old Burlington Street, London W.1. [2706

SITUATIONS VACANT

REQUIRED for service overseas.
(1) Radio officer with current 1st class R.T.O. licence to be based in the Lebanon.
(2) Engineer to be based in central Europe. Minimum qualification "C" licence endorsed for Gipsy Queen Series 70.
FULL details to Airwork Ltd., Overseas Div., Sutton Lane, Langley, Bucks. Tel.: Langley 520. [2699

AIRCRAFT maintenance engineer required for NIGERIA for one tour of 15-24 months on contract. Salary scale (including expatriation pay) £1,170 rising to £1,453 a year. Gratuity at rate of £150 a year. Outfit allowance £60. Free passages for officer and wife. Assistance towards cost of children's passages or grant up to £150 annually for maintenance in U.K. Candidates, between 28 and 40, must hold aircraft maintenance engineer's licence in categories "A" and "C" on Auster Autocar airframes and Cirrus Major 3 engines, and should have had considerable experience of aircraft maintenance.—Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience, and quote M2A/40485/FE. [2731

DEPARTMENTAL production manager, experienced in the manufacture of acrylic aircraft components, required by leading industrialists.
APPLY, giving details of experience.—Box 8354. [2732

CHIEF stressman required.—Apply, stating age, experience and salary required to Aviation and Engineering Projects, Ltd., Alexandra Road, Hounslow. HOUnslow 9621. [2686

FABRIC workers (male or female), skilled, wanted for covering aircraft components. Good wages and bonus.—Apply Personnel Manager, Helliwells Aircraft Ltd., Birmingham Airport, Elmdon, Birmingham. [2738

DOWTY HYDRAULIC UNITS, Ltd., invite application for senior and junior post in their design office, on a varied and rapidly-expanding programme of work on commercial hydraulic equipment. KNOWLEDGE of light hydraulics is desirable, but draughtsmen with precision engineering experience also suitable.
WORKING conditions and prospects for advancement are good and the firm has a realistic pension scheme.—Apply to Personnel Department, Dowty Hydraulic Units, Ltd., Ashchurch, Glos. [2726

WEIGHTS engineer with aircraft experience urgently required. Applications should be in own handwriting to Personnel Manager, Scottish Aviation Ltd., Prestwick Airport, with details of age, experience and salary required. [2698

SITUATIONS VACANT

STRESSMAN required with experience of calculations on components for very high speed machinery, preferably as applied to aircraft. H.N.C. or equivalent essential. Superannuation scheme. Apply Box 8310. [2715

JUNIOR and senior aircraft mechanical draughtsmen wanted. Please apply, stating age, experience and salary required, to Chief Draughtsman, Martin-Baker Aircraft Co., Ltd., Higher Denham, nr. Uxbridge, Middlesex. Tel.: Denham 2214. [2711

TECHNICAL Artist
HISPANO SUIZA'S English associate, British Manufacture and Research Co., Ltd., of Grantham, urgently require a first-class technical artist for the preparation of exploded and sectioned illustrations on light gunnery and fire control equipment.
THE successful applicant will require to have had extensive experience of all aspects of technical illustrating and to have a sound knowledge of all mediums, including scraper board and air brush.
THE Company offers excellent sports and welfare facilities and a voluntary pension and life assurance scheme after a qualifying period.—Applications, with personal details, qualifications, age, experience, and salary required, to British M.A.R. Co., Ltd., Grantham, Lincs., quoting reference AWK/CAHP/Staff F. [2696

CHIEF Stressman is required by Normalair, Ltd., to be responsible for strength calculations in connection with aircraft pressurising and air conditioning equipment, including cold air units and high altitude breathing equipment, and other new projects. An engineering degree or equivalent is essential.
APPLICATIONS, stating age, experience, qualifications and salary required, are to be addressed in the first instance to the Personnel Officer, Normalair, Ltd., Yeovil. [0347

CHIEF research engineer. Company of International repute, intending to undertake research and development of a wide range of domestic appliances and allied equipment at their British headquarters, seeks the services of a chief research engineer. This is a new appointment at a high executive level, and would be remunerated accordingly. The successful candidate would have ample resources and a congenial environment in a virile and expanding organisation to facilitate his work.
ESSENTIAL requirements include a record of success in the field of engineering research and development, executive experience and good academic qualifications. Interviews would be arranged in London. Applications giving full details of age, education and experience should be addressed in confidence to Box 8382. [2763

SITUATIONS VACANT

NORMALAIR LTD., have vacancies in Yeovil for design draughtsmen, D.O. checkers, technicians, stressmen, liaison engineers, for work on aircraft pressurising and high altitude breathing equipment and cold air units.
DESIGN draughtsmen are also required for the Cricklewood office. Generous superannuation scheme, excellent prospects, rapidly expanding organisation.—Applications, stating age, experience, qualifications and salary required, to: Personnel Officer, Normalair Ltd., Yeovil, Somerset.
LOCAL interviews arranged where convenient. [0346

DESIGN draughtsmen, all grades, urgently required on electrical and electronic apparatus for guided weapons and allied projects.—Please write in detail, or send postcard for application form, to the Personnel Manager (Technical Employment), de Havilland Propellers, Ltd., Hatfield, Herts. [0611

MATHEMATICIAN required for Aircraft Research Association Transonic Tunnel to organise work on an electronic computor. Some previous experience desirable. Pension scheme available. Apply to Aircraft Research Association Ltd., 33, Midland Road, Bedford. [2708

WANTED: fully qualified flying instructor, not under 25, for instruction on Austers, Tiger Moths and Proctors with commercial licence endorsed for Proctors and Austers. Accommodation available for single man. Permanency for suitable applicant. Ex-Naval Instructor preferred.—Box 8264. [2705

ARMSTRONG SIDDELEY MOTORS have a vacancy in their technical illustrating department for an experienced technical artist, aged 24-26. Staff position, salary according to age, experience and qualifications. Replies should be addressed to Reference CG/TA1, Armstrong Siddeley Motors, Coventry. [2722

ENGINEERING COMPANY (employing 60 personnel) engaged upon manufacture of aircraft ground equipment require to appoint an inspector to assume full responsibility for inspecting to A.I.D. Standards. Factory located in Southern England. Write Box 8311. [2716

TEST observers required in the Engine Division Development Department in connection with Engine Test and Performance analysis. Work is interesting and offers scope for advancement. Minimum qualification H.N.C. Mechanical Engineering. Good opportunity for young qualified engineers who have completed National Service. Good working conditions and pension scheme. Apply quoting E.D.16, and giving particulars of qualifications, experience and age, to:—The Personnel Manager, Bristol Aeroplane Company, Ltd., Engine Division, Filton House, Bristol. [2744

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have vacancies in their newly formed

WEAPONS RESEARCH DIVISION

AERODYNAMICISTS

With honours Degree in Physics, Mathematics or Engineering and at least two years' experience are required to work in an aerodynamics group on aerodynamic theory and analysis of new weapon projects. Candidates should be familiar with supersonics.

MATHEMATICIANS

With Honours Degree to work on flight dynamics and studies of control systems. A knowledge of numerical mathematics would be an advantage.

ELECTRONIC ENGINEER

A graduate with research and development experience in electronics or with electro-mechanical devices.

Good Salaries and Prospects.
Pension and Life Assurance Scheme.
Apply giving full particulars of academic training and experience to:

A. V. ROE & CO. LTD.
Weapons Research Division, WOODFORD, CHESHIRE.

GLOSTER AIRCRAFT CO. LTD.

GLOUCESTER

HAVE VACANCIES ON SUPER-PRIORITY DESIGN AND DEVELOPMENT PROJECTS

FOR

AIRCRAFT DESIGN DRAUGHTSMEN

(SENIOR & JUNIOR)

Consideration will also be given to Draughtsmen with Mechanical, Structural or Electrical experience.

Also

STRESSMEN

(SENIOR & INTERMEDIATE)

for both strength and flutter calculations.

The conditions of employment are good with progressive salary, good sports and welfare facilities, pension scheme, etc.

APPLICATIONS STATING AGE, PREVIOUS EXPERIENCE AND EMPLOYERS SHOULD BE ADDRESSED TO THE

CHIEF DESIGNER

THE DUNLOP RUBBER CO. LTD., AVIATION DIVISION, COVENTRY

requires

SENIOR DESIGN DRAUGHTSMEN

capable of carrying projects through from conception to completion.

Also

JUNIOR DETAIL DRAUGHTSMEN

and

SENIOR AND JUNIOR STRESSMEN

Experience of light hydraulic or pneumatic equipment would be advantageous.

The company's programme offers excellent prospects of permanent interesting employment under congenial working conditions.

Salary will be commensurate with qualifications and experience, full details of which should be sent to:—

PERSONNEL MANAGER,
DUNLOP RUBBER CO. LTD.,
AVIATION DIVISION
FOLESHILL, COVENTRY

MARSHALLS' AIRPORT WORKS, CAMBRIDGE

ASSISTANT TO CHIEF INSPECTOR (AIRCRAFT)

Owing to continued expansion, applications are invited from persons suitably qualified to join the organization as Assistant to the Chief Inspector (aircraft).

The work involves trial installation, modification, production and major repair of high performance aircraft, and applicants should have a long experience in the aircraft industry or the Services, and knowledge and experience of A.I.D. and/or A.R.B. procedures.

Applications are invited only from those who, by virtue of their past experience, aircraft engineering knowledge and personality, can immediately assume a senior and responsible position.

Applications, with full details, to the Personnel Manager.

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Superbly finished aircraft for Flying Clubs and crop-dusting operators.

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CROYDON AIRPORT, SURREY
Cables: MUIRAIR, CROYDON.

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TO B.S. SPECIFICATION S.P.47

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SITUATIONS VACANT

SAUNDERS-ROE, Ltd., have vacancies for a limited number of experienced aircraft draughtsmen in their design office at Osborne, I.W.—Applicants must have several years' experience of designing aircraft structures and should possess at least an Ordinary National Certificate.

AN aircraft apprenticeship will be considered an advantage. Salaries will be commensurate with age and experience, and assistance with housing will be provided.

APPLY, stating age, experience, etc., and quoting ref. F/12 to Personnel Officer, Saunders-Roe Limited, East Cowes, Isle of Wight. [2694

RADIO mechanics, licensed and unlicensed, are urgently required by Field Aircraft Serivces, Ltd., at the Newcastle base. Applications, giving fullest detail of experience and qualifications if any.—Please address to the Personnel Officer, F.A.S. Ltd., Croydon Airport, Surrey. [2670

FIRST-CLASS mechanical design draughtsmen are required for interesting and important projects.—Please write in detail or send postcard for application form to The Personnel Manager (Technical Employment), de Havilland Propellers, Ltd., Hatfield, Herts. [0610

DRAUGHTSMEN, sound experience aircraft structures, urgently required for interesting work in London and Portsmouth areas by large engineering organisation. Salary £12 per week upwards plus a living allowance if from outside the district. Pension scheme.—Please write giving full particulars of experience and qualifications to Box 8360. [2736

DRAUGHTSMEN, sound experience aircraft electrical work, urgently required for interesting work in London and Portsmouth areas by large engineering organisation. Salary £12 per week upwards plus living allowance if from outside the district. Pension scheme.—Please write giving full particulars of experience and qualifications to Box 8361. [2737

ENGINEER required by Guided Weapons firm near London for work involving many aspects of missile dynamics and flight trials. Experience in aerodynamics essential. Good degree, age about 24/27 and several years' experience in aircraft or missile industry required.—Write in confidence to Box AC 00328, Samson Clarks, 57/61 Mortimer Street, W.1. [2702

"A" AND "C" licensed engineers are required for flying and maintenance duties on York aircraft. Applicants must be fully qualified and willing to undertake duties of flight engineer. Good salaries, leave periods, superannuation scheme, sick benefits, etc.—Apply in writing with full details in first instance to Personnel Officer, FIELD AIRCRAFT SERVICES, Ltd., Croydon Airport, Surrey. [2641

H. M. HOBSON, Ltd., invite applications for positions in the drawing office as follows: designers, detail and modification draughtsmen, checkers, stressmen. The work is concerned with interesting projects connected with fuel metering equipment and hydraulic flying controls for aircraft.—Hobson Works, Fordhouses, Wolverhampton. [0420

DRAUGHTSMEN required in the designs drawing office. These appointments are pensionable and offer good prospects to individuals with initiative and technical ability. Applications giving details of experience and qualifications should be sent to the Personnel Manager, Joseph Lucas (Gas Turbine Equipment), Ltd., Shaftmoor Lane, Hall Green, Birmingham 28. [2720

DRAUGHTSMEN required for interesting work at experimental airfield in connection with the installation of test equipment in the latest types of aeroplanes. Previous aircraft experience preferred.—Write, stating age, salary required, etc., to: Personnel Dept., Vickers-Armstrongs Ltd., Supermarine Works, Hursley Park, Nr. Winchester, Hants. [2727

VACANCIES exist in the Installation Department of Smiths Aircraft Instruments, Ltd., Cheltenham, for Aeronautical or Electrical Engineers having experience of electric and hydraulic servo mechanisms, radio navigation equipment, gyro magnetic compasses and experimental flight testing. A good general knowledge of aircraft construction and operation is essential.

APPLICANTS should hold a degree or the equivalent, have a medical standard equal to Class "A" Life Insurance, and should be willing to travel within the U.K. and abroad.

THE starting salary will depend on qualifications, age and experience.

APPLICATIONS, with details of qualifications, experience and salary required, should be made in writing to the Personnel Department, Smiths Aircraft Instruments Limited, Bishops Cleeve, near Cheltenham, Glos., quoting reference number 42/EN. [2742

TECHNICAL author required by manufacturers of aircraft components. Experience in preparation of publications to M.o.S. and A.R.B. standards. Some knowledge of typography and sales leaflets. Superannuation scheme. Apply Personnel Officer, Sir George Godfrey & Partners, Ltd., Hampton Road West, Hanworth, Middlesex. [2710

SENIOR aerodynamicist required for the aircraft Research Association Transonic Tunnel to direct groups working in model testing, analysis and data, etc. Honours degree or equivalent with several years' experience of research work, preferably on wind tunnels. Pension scheme available. Apply to Aircraft Research Association Ltd., 33 Midland Road, Bedford. [2709

ESTIMATOR required by rapidly expanding light engineering works engaged in high altitude oxygen and other equipment in South West England. Must be capable of working on own initiative. Excellent prospects with pension scheme. Write, giving full details of previous experience and salary required to Box RK 3728, AK Advg. Ltd., 212a Shaftesbury Ave., London W.C.2, quoting 13N/954. [2713

THE DEFENCE RESEARCH BOARD

requires

Engineers and Physicists

The Defence Research Board of Canada requires Graduate Engineers who are either Canadian citizens or British subjects, for full-time employment in Quebec, P.Q., in the following specialized fields:—

Microwave and Electronics Engineer or Physicist—with six to ten years' experience to carry out research and development on guided missiles. The applicant must have experience in planning and directing the work of junior scientists.

Servo-Mechanisms Engineer—to carry out research and development on guided missiles. Experience with electrical and electro-hydraulic servo systems and with navigation equipment desirable.

Electrical Engineer or Engineering Physicist—with experience in electronic computation to carry out development work on aircraft fire control computers—basic knowledge of microwave and servo-mechanism desirable.

Electrical Engineer or Engineering Physicist—to direct electronics designs and electronic systems production engineering for guided missile development. The applicant must have experience in electronic component testing and subminiaturization techniques, and must be capable of directing the work of junior scientists.

Electronic Instrumentation Engineer—to carry out instrumentation work on guided missiles—telemetering and range instrumentation experience desirable. The applicant must be capable of planning and directing the work of junior scientists.

Mechanical Engineers—with six to ten years' experience to carry out design and development on armament systems. The applicant must have experience in planning and directing the work of junior scientists.

Salary. Salaries will be commensurate with experience and qualifications.

Employee Benefits. Modern well-equipped laboratories provide excellent facilities and working conditions for the individual scientist, and every opportunity is presented for advancement. A five-day week and superannuation and hospital-medical insurance plans are in effect. Liberal provision is made for vacation and sick leave.

Applicants may obtain application forms from:

Defence Research Member,
Canadian Joint Staff, London,
Moncorvo House,
66 Ennismore Gardens,
London S.W.7, England.

Applications will be sent to qualified applicants on receipt of letters outlining qualifications and experience.

SITUATIONS VACANT

HANDLEY PAGE, Ltd., require young flight test observers at their Radlett aerodrome. Applicants should have had experience in this type of work and be educated to degree or Higher National Certificate standard. Good salary and flying pay.—Write stating age and full relevant particulars to: Staff Officer, Handley Page, Ltd., Cricklewood, London N.W.2. [2733

ARMSTRONG SIDDELEY MOTORS require young engineers interested in tests covering performance measurement, handling control behaviour, analysis of flight test data, prediction of engine performance and the functional side of engine behaviour. Applicants must possess a Degree or Higher National Certificate. Application to Reference CG/FP2, Technical Personnel Manager, Armstrong Siddeley Motors, Coventry. [2721

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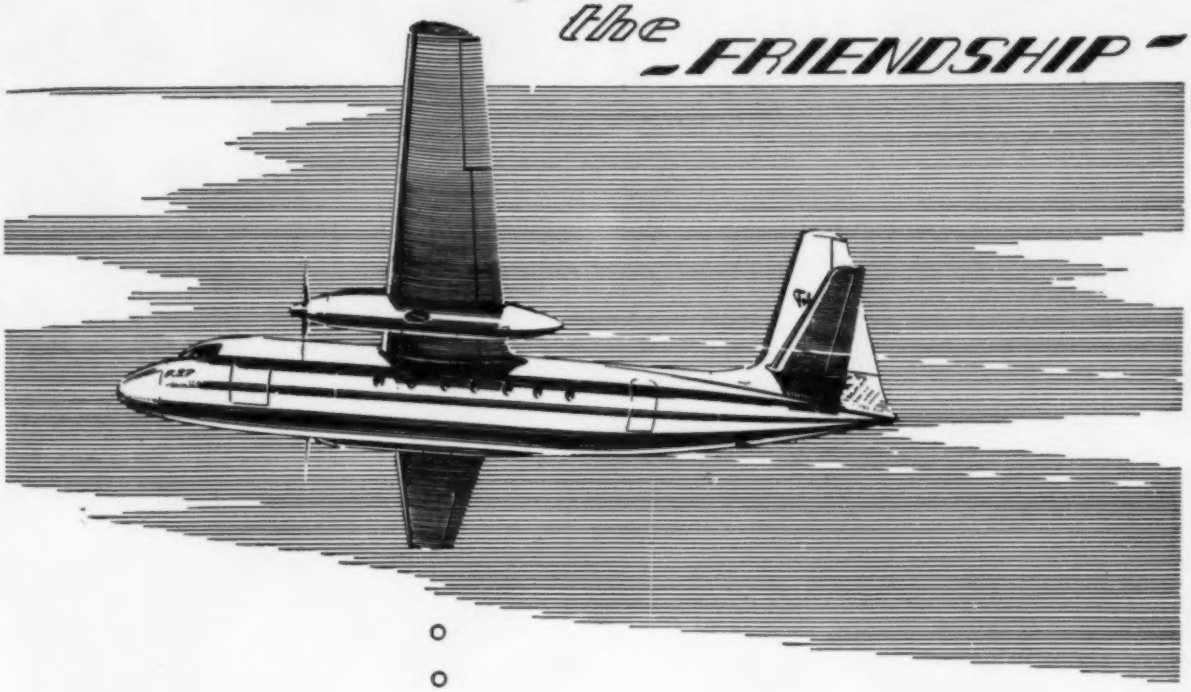

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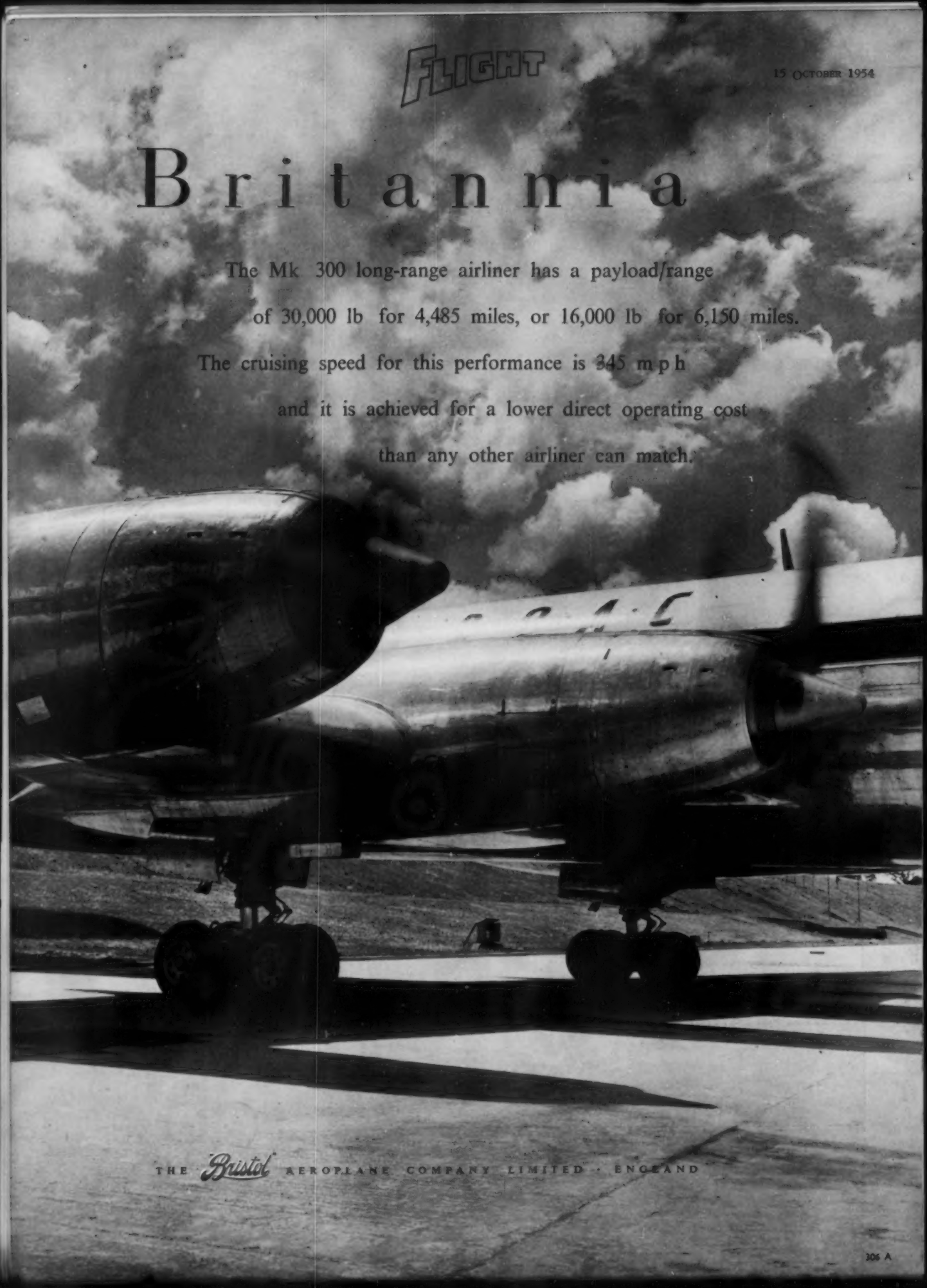

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